DRAFT

Integrated Water Plan

Program Environmental Impact Report

State Clearinghouse #2003102140

CITY OF SANTA CRUZ

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TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

Chapter 1 Summary

1.1 INTRODUCTION

The City of Santa Cruz Water Department (City) has prepared a Draft Program Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA) Guidelines and to the California Code of Regulations, Public Resources Code, Division 13. The EIR serves as a public disclosure document explaining the effects of the proposed Program on the environment, alternatives to the Program, and ways to minimize adverse effects and to increase beneficial effects. The EIR also provides the public, and Responsible and Trustee Agencies reviewing this Program, with information about the potential effects on the local and regional environment associated with implementation of the proposed Program.

1.1.1 Purpose of the EIR

The purpose of this EIR is to allow the Santa Cruz City Council to determine whether or not to approve the recommended *Integrated Water Plan* (IWP) as the City's future water supply plan, and to identify which of the two water supply alternatives within the IWP (City-only or Cooperative Desalination) is the environmentally superior program. Should the Council decide to move forward with the recommended IWP, this EIR will be used to determine which plant location and pipeline routes are environmentally superior.

1.1.2 Type of EIR

Pursuant to *CEQA Guidelines* Section 15168, a Program EIR may be prepared on a series of actions that can be characterized as one large project, and are related either:

- Geographically;
- As logical parts in the chain of contemplated actions;
- In connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or
- As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways.

This EIR involves the evaluation of a series of actions comprising a comprehensive water plan, and therefore meets the criteria indicated above. The program elements identified in this EIR are integral parts of the City's IWP, which provides solutions for existing and projected water supply deficiencies within the City's service area, and had been carried forward for analysis in this EIR.

1.1.3 Summary of the Integrated Water Plan

The IWP provides a flexible phased approach for reducing near-term drought year shortages and for providing a reliable supply that meets long-term needs while ensuring protection of public health and safety. The IWP consists of three major components:

- Water conservation programs to maximize the use of the existing water resources.
- Customer curtailment up to 15% in times of shortage.
- Water supply development provided by a 2.5-million-gallon-per-day (mgd) desalination plant. Two operational strategies were identified: Alternative D-1 would provide water supply during a drought to the City service area, and Alternative D-2 would continue to provide water to the City during droughts but would also provide water supply for its potential partner, Soquel Creek Water District (SqCWD), during nondrought periods. Facilities associated with the two operational alternatives would generally be the same, except the implementation of D-2 would require additional conveyance and pumping facilities.

1.1.4 Alternatives Considered in the IWP

During the development of the IWP, several alternatives to the curtailment and water supply components were considered. The curtailment options that were considered include:

- No water shortage – perfect reliability, imposing no hardship on customers.
- 15 percent shortage – a worst-case peak-season curtailment of 15 percent, requiring periodic watering restriction on outdoor usage.
- 25 percent shortage – a worst-case peak-season curtailment of 25 percent, requiring more frequent restrictions than the 15 percent level, and water rationing under the worst case conditions.

The water supply augmentation alternatives that were considered in the formulation of the IWP included:

- Seawater Desalination
- Wastewater Reclamation/Groundwater Exchange on the North Coast
- Santa Margarita Aquifer at Live Oak
- North Coast Upgrades
- Coast Pump Station Upgrades
- Treatment Upgrades

1.1.5 EIR Process

The EIR process included circulation of a Notice of Preparation (NOP) for the proposed Program to local, state, and federal agencies and other interested parties, and a scoping meeting to present the proposed Program to the general public and to receive public input regarding the proposed scope of analysis (see Appendix A for the NOP and scoping comments). In addition to the scoping meeting, the City held early consultation meetings with public agencies regarding the proposed Program including Soquel Creek Water District (SqCWD), University of California–Santa Cruz (UCSC), Department of Health Services (DHS), Regional Water Quality Control Board (RWQCB), Monterey Bay National Marine Sanctuary (MBNMS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and California Coastal Commission (CCC).

1.1.6 EIR Process - Draft EIR

As required by *CEQA Guidelines* Section 15120, this Draft EIR includes a summary, program description, characterization of the environmental setting, evaluation of potential environmental impacts resulting from implementation of the proposed Program, mitigation measures to reduce potentially significant impacts, and a discussion of the range of reasonable alternatives to the proposed Program. The Draft EIR is intended to inform the public of the potential impacts or benefits that would result from implementation of a proposed Project.

In accordance with *CEQA Guidelines* Section 15087, this EIR is circulated to local, state, and federal agencies, as well as interested organizations and individuals that may wish to review the document, during the 45-day comment period. The City will hold a public meeting to provide the public with an opportunity to comment on the EIR on June 30, 2005. Written comments may be addressed to the following:

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(clearly marked "IWP EIR comments" in subject line)

Written and oral comments received during the public comment period will be addressed in a Response to Comments document, prepared based on the requirements identified in *CEQA Guidelines* Section 15132. This document, in combination with the Draft EIR, will constitute the Final EIR. Lead agencies may provide an opportunity for review of the Final EIR by the public or by the commenting agencies before approving the project.

Prior to the City Council taking action on the Program, the City is required to prepare written Findings for the Program. Where one or more significant environmental effects of a project have been identified in the EIR, a written findings consisting of a brief explanation of the rationale for each finding will be provided.

1.1.7 EIR Process - Mitigation Monitoring and Reporting

A mitigation monitoring and reporting program for the changes to the project that the City adopts or has made a condition of project approval in order to mitigate or avoid significant effects on the environment will be developed.

1.1.8 EIR Process - Lead Agency Action and Statement of Overriding Considerations

After reviewing the Final EIR and in conjunction with making findings, the Santa Cruz City Council will then consider EIR certification, adoption of the mitigation monitoring and reporting program, and approval of the IWP Program at a regularly scheduled City Council meeting.

When the lead agency approves a project that will result in significant effects that cannot be avoided or substantially lessened, the agency shall state in writing the specific reasons to support its action based on the Final EIR and/or other information in the record. The statement of overriding considerations shall be supported by substantial evidence in the record (*CEQA Guidelines* Section 15093).

1.1.9 EIR Process - Subsequent Environmental Documentation

As engineering design of the desalination plant and associated components proceeds, more detailed information would be available to facilitate the preparation of a project-level EIR for the first increment (“2005”) of the 2.5 million-gallon-per-day desalination plant. Subsequent project-level environmental review would assess site-specific impacts of the plant design, provide details of a pipeline route and right-of-way if necessary, re-evaluate the growth projections, confirm the timing and level of expansion for the next increment of water supply, and readjust the capacity and timing of the future expansion. Currently, expansion to 3.5 mgd and 4.5 mgd is expected to occur in 2015 and 2025. Construction of the desalination plant would not proceed until a project-level EIR for the desalination plant has been prepared and approved by the Santa Cruz City Council.

1.2 BACKGROUND

1.2.1 Water Supply Problem

The primary water management problem presently facing the City of Santa Cruz is the lack of adequate water supply during periods of drought.

In normal and wet years when rainfall and runoff are normal to abundant, base flows in the coast and river sources are restored by winter rains. Storage in Loch Lomond is typically replenished to full capacity with runoff from the Newell Creek watershed and water diverted from the San Lorenzo River at Felton. Under these weather conditions, the water supply system is capable of meeting the community’s total annual water requirements.

The system is highly vulnerable to shortage in below normal, dry, and drought years, however, when the San Lorenzo River and coast sources run low. In these year types, the system relies more heavily on water stored in Loch Lomond to satisfy demand, which draws down the reservoir level lower than usual and depletes available storage. In critically dry or multi-year drought conditions, the combination of very low surface flows in the coast and river sources and depleted storage in Loch Lomond reservoir reduces available supply to a level that cannot support even average dry season demands.

The City experienced severe water supply deficiencies in both the 1976-77 and 1987-92 droughts. In 1977, the City imposed severe water rationing in response to a critical shortage of water. During the 1987-92 drought, a water supply emergency was declared and either usage restrictions or rationing was imposed each year for five consecutive years. The 1976-77 event has since been established as the most severe drought of record, and is used by the City as a benchmark for assessing system reliability. If a critical drought similar to 1976-77 occurred in 2005, shortages would be in excess of 40%.

Operations studies conducted by the City show that the problem of water shortage will worsen, in terms of both frequency and magnitude, as the population of the region grows and demand for water increases over time.

1.2.2 Integrated Water Plan Process

The City has been actively considering possible new water supplies for many years in order to address the problem of water shortage and to plan for future growth. Past efforts to augment water sources have made little progress, however, due to stakeholder disagreement on the appropriate course of action.

In 1997, the City initiated a new effort using a broader-based approach known as integrated water planning to consider all practical options for decreasing demand and increasing supply. As part of this effort, a series of background studies were undertaken, including the following.

- Water Demand Investigation (Maddaus Water Management 1998)
- Water Conservation Plan (Gary Fiske & Associates 2000)
- Water Curtailment Study (Gary Fiske & Associates 2001)
- Alternative Water Supply Study (Carollo Engineers November 2000).
- Evaluation of Regional Water Supply Alternatives (Carollo Engineers March 2002)

Work on the IWP began in March 2001 and was overseen by the City's Integrated Water Plan Committee (IWPC), which included three members of the Water Commission, three members of the City Council, and one ex-officio member. The IWPC reviewed all documents and public meeting materials, provided key input at every stage of the IWP process, and met regularly with staff and consultants on a bi-weekly basis. All meetings were open to the public; in addition, two public workshops were held to educate the public and answer questions and concerns.

The process of developing the IWP involved the following steps:

- Formulation of objectives
- Development of a computer modeling tool to analyze and compare alternative strategies
- Definition of the model's "base case," which included current supplies and infrastructure as well as those system enhancements that would be made independent of the IWP, and assessment of shortages that City customers would experience under such base case conditions
- Identification and characterization of the City's conservation, curtailment, and supply options
- Development and refinement of evaluation criteria (e.g., economic, environmental, and institutional)
- Development of alternative resource strategies
- Evaluation of the strategies against the evaluation criteria and recommendation of preferred strategies
- Description of the key steps for implementation of the preferred strategies

1.2.3 Integrated Water Plan Recommendations

Based on the process described above, the IWP identified two desalination strategies: D-1 (City-only Desalination) and D-2 (Cooperative Desalination) at 15 percent curtailment as the two preferred alternatives. Because there were no clear advantages to either D-1 or D-2, the decision was made to defer selecting one or the other as the final preferred strategy until the completion of this EIR.

1.2.4 Ongoing Planning Issues and Uncertainties

A basic assumption made in developing the IWP was that the City would continue to use its existing sources of supply into the future as it has in the past. There are, however, a series of ongoing challenges facing the City over its existing sources that potentially could lead to some loss of supply in the future, although it is uncertain to what extent and which supplies might be impacted.

Continued access to the same amount of supply from the north coast sources will depend on the outcome of a Section 10 permit application and accompanying habitat conservation plan for city activities that ultimately must be approved by the U.S. Fish and Wildlife Service, NOAA Fisheries, and California Department of Fish and Game. These agencies have authority under the federal and state Endangered Species Act to regulate projects that are likely to affect species listed as threatened or endangered. The City is also in the process of rehabilitating the North Coast raw water pipelines and diversions to reduce losses due to leakage or structural failure. The project is under a separate CEQA review process and construction will likely take place over the next 15 – 20 years. While the water supply planning that led to the IWP program is based on reducing leakage on the North Coast

Pipeline, the City must pursue rehabilitating the system to provide a reliable supply into the future regardless of the outcome of the IWP.

The City is also in the process of developing and submitting filings to the State Water Resources Control Board to rectify a historical technical deficiency in the water rights on Newell Creek and the San Lorenzo River (at Felton), and to extend the time within which the City can put water to full beneficial use on its permits for diversion to storage on the San Lorenzo River in Felton. Based upon the original filings, which were thought to be adequate due to the anticipated use of Loch Lomond storage reservoir, these water rights allow only for diversion to storage and not for direct diversion. This circumstance makes the water supply technically unavailable as a source for City use during times when, for example the reservoir is receiving more inflow from Newell Creek than is released downstream. The water rights filings are intended to correct this historical deficiency and bring the water rights and current operations into conformance. The City will ensure CEQA compliance for these actions, which are independently required and useful to perpetuate the City's ability to use these sources on an ongoing basis.

Finally, the ability to produce water from the Live Oak wells, in drought years and potentially all years, may be compromised by continued deterioration of groundwater basin conditions due to region-wide over pumping of the Purisima aquifer (see Section 5.1 and Appendix C). The City is currently in the process of rehabilitating its wells and treatment plant to their original capacity of 2 mgd. Any or all of these challenges could lead to some loss of existing water supply that would, in turn, affect the recommendations in the IWP about the capacity and the timing of the recommended desalination strategies in future years.

1.3 SUMMARY OF PROPOSED PROGRAM

The proposed Program, carried forward from the Integrated Water Plan (IWP), consists of three primary components:

- Conservation: a series of programs that reduce long-term water demand;
- Curtailment: mandatory rationing that would reduce the water demand and extend the water supply during dry or critically dry years;
- Additional Water Supply: 2.5 million gallons per day (mgd) desalination facility, with the potential for expansion to 3.5 mgd in 2015 and 4.5 mgd in 2025.

A cornerstone of the IWP is to achieve the maximum practical water-use efficiency through conservation. Both state water law and the City's General Plan call for a strong emphasis on water conservation and elimination of water waste to stretch existing supplies, to minimize the need for new water sources, and to protect the environment. The City is also a signatory to the *Memorandum of Understanding Regarding Urban Water Conservation in California* and is thus committed to the implementation of 14 water conservation best management practices, many of which are included in the City's *Water Conservation Plan*.

The Water Conservation Plan was adopted February 2000 by City Council, and directed staff to begin immediately with implementation of the plan. The *Water Conservation Plan* identified 11 new conservation programs to be implemented in sequence of priority between 2000 and 2006. A number of programs have already been started. Implementation of these programs would result in an estimated annual savings of nearly 300 million gallons by 2010 (Gary Fiske & Associates 2003). These conservation programs are discussed below.

In the process of developing the IWP, the City made a fundamental recommendation to not meet full demand in drought years when surface water supplies fall short. The IWP instead calls for supplying 85 percent of normal demand in critical drought years like the 1976-77 event and for a corresponding reduction in peak season water use of 15 percent that would be achieved through temporary watering restrictions and or rationing.

The 15 percent level of cutback was selected as the best compromise that met the overall goal of reducing drought shortages, considering the tradeoffs between multiple objectives to minimize costs, to reduce environmental impacts, and to protect public health and welfare by ensuring sufficient water for basic domestic and business purposes. The curtailment component assumes that customers can and will tolerate a 15 percent overall reduction in water use on a short term basis without undue hardship or substantial economic impact. The greatest impact of curtailment would be on residential and commercial landscaping that would suffer as a result of cutbacks in irrigation during the dry season.

Acceptance of less than full supply in drought years means the capacity of the recommended desalination facility is approximately half the size it would otherwise have to be if the City opted to meet full demand in all years. The recommended plan features a 2.5 mgd desalination facility with two future capacity increments of 1.0 mgd each, eventually totaling 4.5 mgd. To meet full demand in all years would require initially building a 5.0 mgd facility and expanding it to 8.0 mgd by the end of the planning period.

The unserved demand anticipated in the curtailment component of the IWP would total about 500 million gallons in a severe drought year. This temporary reduction in use would be in addition to the nearly 300 million gallons per year in ongoing water savings gained by improvements in efficiency anticipated from conservation programs by the year 2010.

The additional water supply component would consist of two operational scenarios: Program Alternative D-1 and Program Alternative D-2. Program Alternative D-1 would provide supplemental water supply to the City's service area during drought events. Program Alternative D-2, cooperative project, would provide supplemental water supply under normal (non-drought) operations to a potential partner (i.e., SqCWD). Tables 1-1a and 1-1b show the differences in operations of the two alternatives under the first increment of 2.5 mgd and under the subsequent increments of 3.5 and 4.5 mgd.

Table 1-1a
Desalination Plant Operations
First Increment: 2.5 mgd

CHARACTERISTIC	D-1	D-2
PARTICIPATING AGENCY	City of Santa Cruz	City of Santa Cruz SqCWD
PURPOSE	Drought Protection	Drought protection for City and supplemental supply for SqCWD
PRIORITY OF OPERATION		City of Santa Cruz, as needed SqCWD, when not needed by City, or when surplus capacity exists
TYPE OF OPERATION	Intermittent	Variable, as City operation would be a function of drought SqCWD operation would be a function of supplemental supply requirements for the groundwater basin
TIMES OF OPERATION (YEARS)	1 year in 6 (15 percent of years)[1]	Potentially 6 years in 6 (100 percent of years) based on “Type of Operation” indicated above
TYPE OF WATER YEAR	Dry, Critically Dry	All year types (wet, normal, dry, and critically dry)
SEASON OF OPERATION	Summer, fall (May–October)	Potentially year-round
NORMAL PRODUCTION LEVEL	2.5 mgd	1.25 mgd when SqCWD operates 2.5 mgd when City operates
POTENTIAL OPERATING RANGE	Up to 2.5 mgd	Up to 2.5 mgd when jointly operated by City and SqCWD Use of desalination water by SqCWD to restore groundwater basin

1 *There is a 15 percent chance in any one year that the desalination plant would be operated.*

Table 1-1b
Desalination Plant Operations
Subsequent Increments: 3.5 mgd in 2015; 4.5 mgd in 2025

CHARACTERISTIC	D-1	D-2
PARTICIPATING AGENCY	City of Santa Cruz	City of Santa Cruz SqCWD
PURPOSE	Drought Protection	Drought protection and supplemental supply for City and long-term supplemental supply for SqCWD
PRIORITY OF OPERATION		City of Santa Cruz, as needed SqCWD, when not needed by City, or when surplus capacity exists
TYPE OF OPERATION	Intermittent	Variable, as City operation would be a function of drought, and SqCWD operation would be a function of supplemental supply requirements for the groundwater basin
TIMES OF OPERATION (YEARS)	1 year in 6 (15 percent of years)[1]	Potentially 6 years in 6 (100 percent of years) based on "Type of Operation" indicated above
TYPE OF WATER YEAR	Dry, Critically Dry	All year types (wet, normal, dry, and critically dry)
SEASON OF OPERATION	Spring, summer, and fall (March–October)	Potentially year-round
NORMAL PRODUCTION LEVEL	3.5 mgd in 2015 4.5 mgd in 2025	1.25 mgd when SqCWD operates 3.5 to 4.5 mgd when City operates
POTENTIAL OPERATING RANGE	Up to 1.25 mgd could be needed on a regular basis in later years as a supplemental water supply for City	Up to 4.5 mgd when jointly operated by City and SqCWD Use of desalination water by SqCWD to restore groundwater basin

1 *There is a 15 percent chance in any one year that the desalination plant would be operated.*

Both Program operational alternatives would require construction of a desalination plant and associated appurtenances. These include the desalination plant area (at one of three possible sites – the Industrial Park Area, Shaffer Road/Antonelli's Pond, or Terrace Point; see Figures 4-1 and 4-2 in Chapter 4 of this EIR), the raw water intake, the raw water pipeline (along Corridor 1), the treated water distribution pipeline (along Corridor 2 or 3), and a concentrate discharge pipeline (along Corridor 1 or 4). For Alternative D-2, an additional pipeline would be required (along Corridor 5, 6, or 7; see Figures 4-5 and 4-6 in Chapter 4 of this EIR). The City has not selected sites or locations for development of these facilities, and has therefore evaluated them at an equal level of detail in Chapter 5 of this EIR.

1.3.1 Alternatives Evaluated

The alternatives analysis describes a range of reasonable alternatives to the proposed Program that could feasibly attain most of the basic objectives of the proposed Program, while avoiding or substantially lessening any significant impacts, and evaluates the comparative merits of the alternatives (State *CEQA Guidelines* Section 15126(a)). Alternatives that avoid or substantially reduce significant impacts are considered, even if these alternatives would impede to some degree the attainment of Project objectives, or would be more costly (State *CEQA Guidelines* Section 15126.6(b)). The following alternatives are considered in Chapter 8 of this Draft EIR:

No Program Alternative. The No Program alternative assumes the continuation of existing conditions within the City's Service Area. Water would continue to be supplied by surface and ground water sources. No supplemental supply would be developed at this time. For this reason, peak year demands during drought years would unlikely be met and require customers to curtail to a level as high as 45 percent. The conservation program, which is currently being implemented, would continue.

No Curtailment Alternative. This alternative is a variation of Alternatives D-1 and D-2. It would increase desalination facility sizing (future 8 mgd) such that water production could increase during drought years and no curtailment (0 percent) would be required of City customers. The conservation program, which is currently being implemented, would continue.

High Curtailment Alternative. This alternative is a variation of Alternatives D-1 and D-2. It would decrease desalination facility sizing (future 4 mgd) but require a higher level of curtailment (25 percent systemwide) by City customers during drought years. The conservation program, which is currently being implemented, would continue.

CEQA requires the identification of an environmentally superior alternative. Based on the information contained in Chapter 8, and in accordance with CEQA, the High Curtailment Alternative would be the environmentally superior alternative because it would marginally reduce environmental effects associated with the operation of the facility, compared to the proposed Program. The tradeoff of this alternative, however, is that it would create greater social and economic effects on City water customers during drought conditions that are not required to be addressed in this report.

1.4 SUMMARY OF IMPACTS AND MITIGATION MEASURES

A summary of the impacts of the Proposed Program is provided in this section. These include those impacts that are significant and unavoidable, cumulative impacts, and significant impacts that can be mitigated.

1.4.1 Significant and Unavoidable Impacts

The Proposed Program was found to cause significant and unavoidable impacts for one issue area - Noise. This is covered in more detail in Section 5.6 as well as in Chapter 7 (Cumulative Impacts), as this impact is also significant and unavoidable at a cumulative level.

Noise

The construction of new water conveyance pipelines would primarily be placed within existing roadways, where noise-sensitive receptors along the alignment routes include residential dwellings, schools, churches, and medical facilities. As there is potential for construction to occur between 10:00 p.m. and 8:00 a.m. and within 100 feet of noise-sensitive receptors, nighttime construction activities would not comply with the applicable construction ordinances. The impacts, though temporary because they would only occur during the construction period, would result in significant impacts that cannot be mitigated.

1.4.2 Cumulative Impacts

The Proposed Program was found to cause significant and unavoidable impacts on a cumulative level for three issue areas – groundwater storage and seawater intrusion, noise, and traffic.

Groundwater Storage and Seawater Intrusion

While the impact of operating the City's Live Oak well field has not changed over the last 30 years, increased groundwater use outside of the City service area during the same time period has created a potentially significant cumulative impact. As indicated by conditions developed over the last 10 years, additional pumping by Soquel Creek Water District and privately owned inland wells has lowered the amount of offshore flow available for capture by the well field (Hopkins Groundwater Consultants, Inc. 2004).

Alternative D-1 does not provide additional supply to offset over-pumping by other groundwater users and consequently does not mitigate the present and future cumulative groundwater extraction impacts on the Purisima aquifer.

Alternative D-2 provides additional supply to offset pumping by SqCWD and also provides a contingency whereby the City can use up to 1.25-mgd year-round. Both water purveyors (the City and SqCWD) would be allowed continued use of existing groundwater supplies and would gain access to additional supply from the desalination facility. This alternative offers the greatest potential benefit to the groundwater basin by providing a supply to each major groundwater user, thus preventing the need to increase future use of the limited groundwater resources. Nevertheless, cumulative impacts would still occur due to ongoing production at historical rates by all pumpers in the Purisima aquifer.

While no information is available to determine region-wide groundwater pumping impacts associated with well interference, stream flow depletion, and subsidence, groundwater extraction from all pumpers could potentially result in cumulative impacts. Since the The levels of interference drawdown due to the operation of the Live Oak well field are periodic, infrequent, and have been historically tolerable, the City's pumping would be considered less than significant, and thus its contribution to potentially significant cumulative impact is not considerable.

The provision of mitigation measures such as the utilization of the existing and recently expanded coastal monitoring well network as an early-warning system to detect conditions that might develop into a potential for seawater intrusion (Mitigation Measure 5.1-6a), the redistribution of City and SqCWD pumping (Mitigation Measure 5.1-6b), the modification of pumping patterns (Mitigation Measure 5.1-6c), or the establishment of a regional groundwater management agency (Mitigation Measure C-1) are proposed to reduce the City's incremental contribution, but impacts may still be significant and unavoidable.

Noise

If construction activities for the Proposed Program occur simultaneously with highway construction activities for the Highway 1/17 Widening for Merge Lanes project, then nighttime construction would be necessary to reduce cumulative traffic impacts (described in further detail below), and though the impacts would only occur during the construction period, they would be a significant and unavoidable cumulative impact.

Traffic

If construction activities for the Proposed Program occur simultaneously with highway construction activities for the Highway 1/17 Widening for Merge Lanes project, then lane closures would occur at one off-ramp throughout the entire construction duration, and sporadically for a week at a time during the evening hours at other locations. Although Caltrans would maintain two lanes of traffic on the highway, construction activities could slow traffic, thus causing motorists to select surface street routes to bypass the affected highway segments. Any vehicles diverted from the highway would add to the traffic volumes on Soquel Drive and Soquel Avenue, with an increase in both construction and other traffic on these roadways resulting in significant cumulative impacts. The implementation of mitigation that would shift pipeline construction to nonpeak, nighttime hours (Mitigation Measure C-2), would reduce the cumulative traffic impacts to less than considerable, but would result in a significant unavoidable impact to noise.

1.4.3 Significant Impacts that Can be Mitigated

Chapters 5 and 6 discuss in detail the potential impacts of the Proposed Program for 14 different environmental issue areas, including growth inducement and the secondary effects of growth.

Growth Inducement and Secondary Effects of Growth

The proposed Program was evaluated for its potential to directly or indirectly induce growth of population, economic development, or housing construction. The significance of growth impacts was considered against the following criteria:

- remove an obstacle to growth (CEQA Guidelines 15162.2(d)).
- bring water service to a geographic area where it is not now available.
- be inconsistent with adopted general plans concerning population or housing growth.
- lessen existing planning regulations and land use controls with the program.
- induce growth at the University.
- be operated within the City's service area in a way that would utilize intended drought reserve capacity to meet needs for ongoing growth, leaving the city vulnerable in the future.

For each criterion, four operation scenarios of the Proposed Program were considered – the first increments of Alternatives D-1 and D-2, and the subsequent increments of Alternatives D-1 and D-2. The findings are summarized below, in Table 1-2 (note that this is the same table as Table 6.5-1 in Section 6.5 of this EIR).

For the first increment of both alternatives, there is no impact with respect to growth inducement. With respect to the subsequent increment of Alternative D-1, the analysis shows that the proposed Program potentially could induce growth. That is, if the City is unable to continue growing because of the limited capacity of its existing sources in normal water years, then the subsequent increments of desalination water could remove that obstacle. Future environmental analysis would be necessary at the time a change in plant operation or expansion is required to ensure that the development of additional water supply is responsive to planned growth. In addition, further evaluation will be required to assess impacts regarding consistency of the program with the next General Plan.

With respect to the subsequent increment of Alternative D-2, it would be speculative at this time to say if water supply will become a limiting factor or the limiting factor to population, economic, or housing growth in the mid-county region. Accordingly, it cannot be determined at this time whether the proposed Program would remove such an obstacle to growth. Any potential impacts of growth inducement in the mid-County area would be addressed and if necessary, mitigated, in the District's water supply planning documents and accompanying EIR.

Based on this evaluation, neither Alternative D-1 nor D-2 is distinctly different from one another in terms of their growth inducing impacts. It is most likely that the City will eventually be limited by the capacity of the existing water supply system and need a new source to allow for continued community growth and development. This possibility, however, is equally likely to occur under Alternative D-1 as under Alternative D-2. Therefore, there is no real distinction between the two alternatives with respect to growth inducement.

Table 1-2
Summary of all impact criteria reviewed for growth

IMPACT	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD
Impact 6-1: The program would remove an obstacle to growth.	No Impact	No Impact	Further evaluation will be required.	To be addressed by SqCWD.
Impact 6-2: Water would be brought to a geographic area where it is not now available?	No Impact	No Impact	No Impact	No Impact
Impact 6-3: The program would be inconsistent with adopted general plans and other regional plans concerning growth.	No Impact	No Impact	Further evaluation will be required.	To be addressed by SqCWD.
Impact 6-4: Existing planning regulations and controls would be lessened with the Program.	No Impact	No Impact	No Impact	No Impact
Impact 6-5: The Program would induce growth at the University.	No Impact	Not Applicable to SqCWD	No Impact	Not Applicable to SqCWD
Impact 6-6: The Program would be operated within the City's service area in a way that would utilize intended drought reserve capacity to meet needs for ongoing growth.	No Impact	No Impact	Further evaluation will be required.	Further evaluation will be required.

<u>Other significant but mitigable impacts</u>

A summary of the significant impacts of the Proposed Program is provided in the Table 1-3. All of these impacts can be mitigated to a less than significant level, with greater detail and discussion on the impacts and mitigations provided in Chapter 5, Environmental Evaluation.

In most cases, the CEQA significance level of impact between Alternatives D-1 and D-2 is similar, except for the impact on local and regional groundwater supply (Impact 5.1-6). For this environmental issue area, <u>Alternative D-2 is likely to provide a beneficial impact on the groundwater basin</u>. The delivery of desalination water to SqCWD during normal and wet years would allow reduced pumping in the district and potentially contribute to additional groundwater in storage.

Table 1-3
Summary of Potential Impacts

IMPACT	OPERATION SCENARIOS[1] ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD
5-1: Hydrology and Water Quality				
Impact 5.1-1: Construction effects on water quality of surface water.	◐	◐	◐	◐
Impact 5.1-2: Discharge of seawater concentrate from the desalination plant could affect the water quality of the Pacific Ocean.	◐	◐	◐	◐
Impact 5.1-3: Storage, use, and disposal of chemicals at the desalination facility could affect water quality of nearby surface waters, the Pacific Ocean, and the Monterey Bay National Marine Sanctuary.	◐	◐	◐	◐
Impact 5.1-4: The Proposed Program could place structures in flooding hazard zones, thereby exposing people and structures to the risk of injury or loss, or could alter drainage and runoff characteristics such that downstream flood hazards would be increased.	◐	◐	◐	◐
Impact 5.1-6: The Proposed Program could affect local and regional groundwater supply by reducing the net storage of the aquifer, causing well interference, depleting surface water flows, causing seawater intrusion, or inducing ground subsidence.	◐	○	◐	◐
5-2: Marine Resources				
Impact 5.2-4: Disturbance to offshore high-relief, hard-bottom, subtidal habitat by anchors or moorings.	◐	◐	--	--
Impact 5.2-9: Disturbance to rocky intertidal invertebrates from construction activities to modify junction structure.	◐	◐	--	--
5-3: Land Use, Planning, and Recreation				
Impact 5.3-1: Construction and operational impacts to adjacent land uses.	◐	◐	--	--

Source: EDAW 2005

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

Table 1-3
Summary of Potential Impacts

IMPACT	OPERATION SCENARIOS[1]			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD
Impact 5.3-2: Conflict with existing land use designations and goals, policies, and programs of affected jurisdictions.	◐	◐	--	--
Impact 5.3-3: Impairment of recreation facilities and activities.	◐	◐	--	--
Impact 5.3-5: Preclude future development at the selected desalination area.	◐	◐	--	--
5-4: Biological Resources				
Impact 5.4-1: Impacts to special-status plant species	◐	◐	--	--
Impact 5.4-2: Impacts to special-status birds, including raptors	◐	◐	--	--
Impact 5.4-3: Impacts to special-status reptiles and/or amphibians	◐	◐	--	--
Impact 5.4-4: Impacts to special-status mammals	◐	◐	--	--
Impact 5.4-5: Input of sediment and/or pollutants into steelhead habitat	◐	◐	--	--
Impact 5.4-6: Increased sedimentation, erosion, and/or pollution into wetland and/or waters of the U.S	◐	◐	--	--
5-5: Air Quality				
Impact 5.5-2: Violate air quality standard or contribute substantially to an existing or projected air quality violation.	◐	◐	--	--
Impact 5.5-3: Expose sensitive receptors to substantial pollutant concentrations.	◐	◐	--	--

Source: EDAW 2005

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

Table 1-3
Summary of Potential Impacts

IMPACT	OPERATION SCENARIOS[1] ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD
5-6: Noise				
Impact 5.6-1: Expose people to or generate noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies	●	●	--	--
Impact 5.6-2: Expose people to or generate excessive groundborne vibration or groundborne noise levels	◐	◐	--	--
Impact 5.6-3: Substantial permanent increase in ambient noise levels in the study area vicinity above levels existing without the Program	◐	◐	◐	◐
Impact 5.6-4: Substantial temporary or periodic increase in ambient noise levels in the study area vicinity above levels existing without the Program	◐	◐	◐	◐
5-7 : Geology, Soils, and Seismicity				
Impact 5.7-1: Potential damage to proposed Program facilities and/or persons involved in construction and operation of facilities (including loss, injury or death) due to seismic hazards	◐	◐	--	--
Impact 5.7-2: Potential for soil erosion and sedimentation from construction activities	◐	◐	--	--
Impact 5.7-3: Damage to Program facilities from corrosive or expansive soils	◐	◐	--	--
5-8: Cultural Resources				
Impact 5.8-1: Destruction or damage to known cultural resources	◐	◐	--	--
Impact 5.8-2: Destruction or damage to as-yet undiscovered/unrecorded archaeological sites	◐	◐	--	--
Impact 5.8-3: Destruction or damage to undiscovered/unrecorded human remains	◐	◐	--	--

Source: EDAW 2005

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

Table 1-3
Summary of Potential Impacts

IMPACT	OPERATION SCENARIOS[1] ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD
5-9: Public Services and Utilities				
Impact 5.9-1: Damage to or interference with existing utility lines from construction activities	◐	◐	--	--
Impact 5.9-3: Result in the generation of a large volume of waste materials	◐	◐	--	--
Impact 5.9-4: Preclude use of existing abandoned WWTP pipeline for future emergency effluent flows	◐	◐	--	--
5-10: Visual Resources				
Impact 5.10-1: Construction may adversely affect visual character of adjacent land uses	◐	◐	◐	◐
Impact 5.10-2: Proposed Program may alter (degrade) the existing visual character of the study area	◐	◐	◐	◐
Impact 5.10-3: Potential for light and glare	◐	◐	◐	◐
Impact 5.10-4: Reduction of irrigation may affect visual quality of the landscape	◐	◐	◐	◐
5-11: Hazardous Materials				
Impact 5.11-1: Accidental construction-related hazardous releases affecting human health and the environment	◐	◐	◐	◐
Impact 5.11-2: Construction-related disturbance of existing contaminated soils and/or groundwater	◐	◐	◐	◐
5-12: Traffic and Transportation				
Impact 5.12-1: Short-term traffic delays for vehicles traveling past construction zones	◐	◐	--	--

Source: EDAW 2005

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

Table 1-3
Summary of Potential Impacts

IMPACT	OPERATION SCENARIOS[1]			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD
Impact 5.12-2: Increase in traffic from construction-related vehicles on roadways serving the Program components	◐	◐	--	--
Impact 5.12-3: Implementation of the proposed Program could increase traffic volume associated with desalination facility operations	◐	◐	◐	◐
Impact 5.12-5: Disruption of access to adjacent land uses and streets, potentially causing safety problems	◐	◐	--	--
Impact 5.12-6: Increase in wear and tear on the designated haul routes used by construction vehicles	◐	◐	--	--
Impact 5.12-7: Temporary disruption to bus service along proposed pipeline corridors	◐	◐	--	--
Impact 5.12-8: Potential to affect rail operations	◐	◐	--	--
5-13: Energy	NO POTENTIAL IMPACTS			

Source: EDAW 2005

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

1.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA requires the identification of an environmentally superior alternative. If the no project (No Program) alternative is determined to be the environmentally superior alternative, CEQA requires that the EIR identify an environmentally superior alternative among the other alternatives (*CEQA Guidelines* Section 15126.6[e]). The identification of the environmentally superior alternative is based on a comparison of impacts that would result from each alternative. This is described in further detail in Chapter 8, Alternatives.

A comparison of the alternatives is provided in Table 1-4 (note that this is the same as Table 8-6 in Chapter 8 of this EIR). Except for the No Program Alternative, all alternatives would meet the basic objectives of the proposed Program. The No Program Alternative would not require the construction or operation of any facilities, and therefore no direct physical changes to the environment would occur.

There are tradeoffs among the alternatives associated with the level of environmental impacts as well as with socioeconomic impacts that are not specifically addressed in this Draft EIR. The No Curtailment Alternative would eliminate the need to ration water during drought conditions, but would require a larger facility that would result in more construction- and operation-related impacts (i.e., to marine resources and energy consumption). The High Curtailment Alternative would increase the curtailment level during peak-season drought conditions, but would require a comparatively smaller facility that would generate marginally less operation-related impacts compared to the proposed Program. Higher curtailment translates to potentially greater effects to the visual quality of landscaping as well as potentially greater social and economic hardships on customers.

Based on above analysis, the No Program Alternative would be the environmentally superior alternative because it would reduce nearly all of the significant impacts identified under the proposed Program. However, consideration of additional water supply would be imperative in the near future in order for the city to meet its existing and future needs. Consistent with CEQA requirements, another alternative must be identified as an environmentally superior alternative. Therefore, the High Curtailment Alternative would be the environmentally superior alternative because it would incrementally reduce operation impacts as compared to the proposed Program.

Yet, even though the High Curtailment Alternative is technically environmentally superior, both the Proposed Program and the High Curtailment Alternative result in few environmental impacts that cannot be mitigated. As such, there is little environmental distinction between the Proposed Program and the High Curtailment Alternative.

Table 1-4
Comparison of Alternatives to Proposed Program

COMPARISON CRITERION	PROPOSED PROGRAM D-1	PROPOSED PROGRAM D-2	NO PROGRAM ALTERNATIVE	NO CURTAILMENT ALTERNATIVE (D-1 & D-2)	HIGH CURTAILMENT ALTERNATIVE (D-1 & D-2)
Generally Meets Program Objectives	Yes	Yes	No	Yes	Yes
Construction-related Environmental Impacts	Initial 2.5-mgd plant	Slightly greater than D-1 (additional pipeline)	No impact	Slightly greater than D-1 (larger footprint)	Slightly less than D-1
Operations-related Environmental Impacts	Effects to marine resources; energy usage	Marine effects greater than D-1; Energy usage –greater than D-1	No impact	Greater than D-1	Slightly less than D-1
Visual impacts associated with landscaping / hardships from curtailment	Up to 15 percent curtailment	Up to 15 percent curtailment	Greater than D-1 (up to 45 percent)	No impact	Greater than D-1 (up to 25 percent)
Growth inducement potential	Meets current shortage, serves planned growth	Meets current shortage, serves planned growth	May not be able to meet planned growth	Same as D-1	Same as D-1
Groundwater recharge	No recharge provided	Greater potential for groundwater recharge	No recharge provided	Greater potential for groundwater recharge (than for proposed program)	Lower potential for groundwater recharge (than for proposed program)

Source: Gary Fiske & Associates 2003; EDAW 2005.

1.6 ENVIRONMENTALLY SUPERIOR OPERATIONAL ALTERNATIVE

In most cases, the CEQA significance level of impact between the two operational alternatives is similar. Greater detail and discussion on the distinctions between the operational scenarios of the alternatives is provided in Chapter 8 – Alternatives for use by decision makers.

Alternatives D-1 and D-2 would require the same facilities, with the exception of an additional pipeline that would be required only for Alternative D-2. Alternative D-2 would operate more frequently than Alternative D-1. The primary differences between the two alternatives are the additional construction and operational impacts of Alternative D-2.

Distinctions between the operational alternatives are seen in the environmental issue areas of hydrology and water quality, marine resources, air quality, hazards, energy, and construction traffic, with Alternative D-1 being environmentally superior. Further discussion of these distinctions is provided in Chapter 8, Alternatives.

1.7 ENVIRONMENTALLY SUPERIOR DESALINATION PLANT AREA

The proposed Program includes three alternative desalination areas, as described in Chapter 4 and as shown in Figures 4-1 and 4-2. The evaluation of the environmentally superior desalination area is primarily focused on potential siting effects, both in terms of construction and operation. It should be noted that because the specific locations of the plant within each area have not been identified, this analysis is based on a generalized potential for impacts. It is possible that such impacts within a site could be completely avoided; however, absent site-specific information, it is assumed that potential effects would occur.

The environmental issues that distinguish the desalination areas include land use, biological resources, noise, and visual resources with the industrial park area being environmentally superior. Further discussion of these distinctions is provided in Chapter 8, Alternatives.

1.8 ENVIRONMENTALLY SUPERIOR PIPELINE ALIGNMENTS

The proposed desalination facility would require three to four pipelines, depending on the operational alternative (a detailed description of the pipeline corridors are described in Chapter 4, Program Description; see Figures 4-1 and 4-2)). They include the raw water intake pipeline (Corridor 1), the treated water distribution pipeline (Corridors 2 and 3), the concentrate discharge pipeline (Corridors 1 and 4), and the Alternative D-2 pipeline (Corridors 5, 6, and 7). The evaluation of these alternative pipelines evaluates the constraints of entire pipeline corridors rather than specific streets within each corridor. All but the raw water intake pipeline include more than one routing option.

The evaluation of the environmentally superior pipeline alignments is primarily focused on siting and constructability, in view of the fact that once the pipelines have been buried underground, potential impacts are unlikely. Similar to the alternative analysis for the desalination area, this analysis is intended to identify the distinguishing factors. The environmental issues that distinguish the pipeline alignment alternatives include recreation, water quality, biological resources, and traffic. Corridor 3 is the environmentally superior route for the treated water distribution line, there is no distinction between Corridors 1 and 4 for the concentrate discharge pipeline, and Corridor 7 is environmentally superior for the Alternative D-2 pipeline. Further discussion of these distinctions is provided in Chapter 8, Alternatives.

Treated Water Distribution Pipeline (Corridors 2 and 3)

Figures 4-1 and 4-2 in Chapter 4 (Program Description) show the location of the two corridors. As both corridors share portions of the corridor south of Mission Street/Highway 1, this analysis focuses on the differences from that point northward to the Bay Street Reservoir. The environmentally superior corridor for the Treated Water Distribution Pipeline would be Corridor 3, as it would result in the least amount of impact. Further discussion of these distinctions is provided in Chapter 8, Alternatives.

Concentrate Discharge Pipeline (Corridors 1 and 4)

Figures 4-1 and 4-2 in Chapter 4, Program Description, show the location of the two corridors. Both corridors share common routes along Delaware Avenue from the proposed desalination area to approximately Almar Avenue. Any differences in the potential for impacts of these two corridors would therefore be associated with the areas that are not shared; east of Almar Avenue and south of Delaware Avenue. Neither pipeline corridor can be determined as environmentally superior according to this analysis. An additional factor not captured in the environmental analysis that could influence the selection of the environmentally superior corridor is the fact that potential impacts would likely be less if the pipeline could be built within an existing corridor. Constructing the concentrate discharge pipeline in the same excavated trench as the raw water intake pipeline would increase environmental impacts of that construction only incrementally compared to pipeline installation along two separate trenches. The viability of that option would be dependent on the engineering parameters of the concentrate discharge pipeline. Further discussion is provided in Chapter 8, Alternatives.

Alternative D-2 Pipeline

Figures 4-5 and 4-6 in Chapter 4, Program Description, show the location of the three options for the Alternative D-2 pipeline. Corridors 5 and 6 share common routes from Water Street (at Ocean Street) to the junction of Soquel Avenue and Capitola Road, then follow those roads, respectively, to end points north and south of Highway 1. These corridors traverse primarily through residential and commercial uses. Corridor 7 traverses Ocean Street from Water Street, and generally follows the railroad right-of-way to 41st Street. The environmentally superior corridor for the Alternative D-2 Pipeline would be Corridor 7, as it would result in the least amount of impact. Further discussion is provided in Chapter 8, Alternatives.

1.9 OTHER TOPICS REQUIRED BY CEQA

1.9.1 Areas of Controversy

Table 2-1 in Chapter 2, Introduction, summarizes comments raised by agencies and the public during the scoping comment period. Some comments received during the NOP public scoping period do not relate to the proposed Program (e.g., reevaluation of the IWP). Such a reevaluation was not considered in this EIR because the Plan was completed with public input. Some issues could not be adequately evaluated in this EIR due to the lack of available information or the speculative nature of the environmental effects. These issues are analyzed on a qualitative level, where feasible.

Issues brought up during the public comment period that are of controversy include effects associated with the City's groundwater pumping operations on the Purisima aquifer (e.g., groundwater balance, salt water intrusion, stream flow interaction, biological resources, subsidence); regional environmental effects associated with combined pumping operations of the City, SqCWD, and other private users on the Purisima aquifer (e.g., groundwater balance, salt water intrusion, stream flow interaction, biological resources, subsidence); and other alternatives to the proposed Program (other water supply options, energy sources, etc.).

1.9.2 Issues To Be Resolved

- The City Council will decide whether to adopt the recommended IWP as the City's future water supply plan.
- The issues to be resolved prior to implementation of the project include:
- The City Council will select a desalination area and pipeline routes based on the environmental analysis presented here, as well as institutional factors and cost.
- The City will further define the operations of the City-only desalination project, as more engineering information is developed. If SqCWD intends to participate in the cooperative project, the City will work with SqCWD to determine the operations scenario. This effort will be captured in an operations agreement that will be adopted by both the City Council and the SqCWD Board of Directors. However, the decision by the SqCWD to participate is entirely independent of this EIR.
- The City will determine the connection point for the concentrate discharge pipeline.
- The City will clarify improvements for the existing SqCWD conveyance system if the cooperative project (Alternative D-2) moves forward.
- The City will determine the necessary improvements for the wastewater treatment plant prior.
- The City will conduct follow-up project-level environmental evaluation for the proposed desalination component once determinations have been made about the operation alternative, desalination plant site, and pipeline corridor alignments and detail specifications are developed. In that document, the City will discuss both site-specific construction detail and operation of the facility.
- The need for expansion of the desalination plant will be based on the actual timing of growth and associated water demand. The City will require review of its water demand projections against those of local and regional plans. This will be conducted as part of the environmental documentation for the desalination plant expansion.
- As a separate process, the City and SqCWD will continue to conduct relevant studies to characterize the regional effects to the Purisima aquifer from individual groundwater pumping operations.

1.9.3 Irreversible Changes Resulting from the Project

Section 15126.2(c) of the *CEQA Guidelines* states: "Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or irreversible nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified."

Operation of the proposed desalination facility (water treatment, operation of the reverse osmosis units, pumping, etc.) would result in an irretrievable and irreversible commitment of natural resources through indirect continued use of fossil fuels. However, because this use of natural resources would be used to meet the objectives of the proposed Program, primarily to provide a reliable water supply and ensure protection of public health and safety, commitment of these resources would be justified.

Chapter 2 Introduction

2.1 PURPOSE OF THE EIR

The City of Santa Cruz Water Department (City) has prepared a Draft Program Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA) Guidelines and to the State of California Public Resources Code, Division 13. The EIR serves as a public disclosure document explaining the effects of the proposed Program on the environment, alternatives to the Program, and ways to minimize adverse effects and to increase beneficial effects. The EIR also provides the public, and Responsible and Trustee Agencies reviewing this Program, with information about the potential effects on the local and regional environment associated with implementation of the proposed Program. The purpose of this EIR is to allow the Santa Cruz City Council to determine whether or not to approve the recommended *Integrated Water Plan* (IWP) as the City's future water supply plan, and if one of the two water supply alternatives within the IWP (City-only or Cooperative Desalination) can be determined to be the environmentally superior program. Should the Council decide to move forward with the recommended IWP, this EIR will be used to determine which plant location and pipeline routes are environmentally superior.

Pursuant to *CEQA Guidelines* Section 15168, a Program EIR may be prepared on a series of actions that can be characterized as one large project, and are related either:

- Geographically;
- As logical parts in the chain of contemplated actions;
- In connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or
- As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways.

This EIR involves the evaluation of a series of actions comprising a comprehensive water plan, and therefore meets the criteria indicated above. The program elements identified in this EIR are integral parts of the City's IWP, which provides solutions for existing and projected water supply deficiencies within the City's service area, and had been carried forward for analysis in this EIR.

This EIR provides more information than typically is presented in a Program-level EIR to facilitate a meaningful analysis and comparison of the alternative operational scenarios and components. Details regarding the desalination intake design and treatment process are provided where preliminary engineering designs are available. General locations of the proposed facilities are also provided although the exact locations within the optional areas are not currently known. In other words, although this document goes beyond the definition of a Program-level EIR, it is not considered a project-level EIR. Site-specific information (e.g., location of the desalination plant within one of the desalination locations) would be developed at a later date and incorporated in subsequent project-level environmental review. Similarly, because the City has not selected a specific desalination plant location or pipeline alignment for the facilities, alternative desalination locations and alternative pipeline routes are all evaluated at an equal level of detail in this EIR. The extent to which one site or corridor is environmentally superior to another will be identified in this EIR.

The two programs selected for further analysis in this EIR are:

- Water Conservation Programs as detailed in the Santa Cruz Water Department, Water Conservation Plan Final Report, drought use curtailments, and Alternative D-1: City-only Desalination; and
- Water Conservation Programs as detailed in the City's Water Conservation Plan, drought use curtailments, and Alternative D-2: Cooperative Desalination.

These programs would balance acquisition of additional water supply and reduction of water demand (conservation and curtailment) to meet customer demands while minimizing environmental impacts and reducing social and economic stress on the City's customers. The principle differences between the alternatives are the operational parameters and the involvement of a potential partner in the Cooperative Desalination Alternative. Because the City has not made a decision on whether to implement Alternative D-1 or Alternative D-2, both are evaluated at an equal level of detail in this EIR. These two operational alternatives are distinct from the Program alternatives as discussed in Chapter 8, which require evaluation at a reduced level of detail in accordance with *CEQA Guidelines* requirements.

This EIR evaluates the potential environmental impacts associated with implementation of the various components of the IWP Program. The information sources for impact analyses include site investigations, past studies, agency consultation, General Plans of the affected jurisdictions, database searches for biological and cultural resources, as well as database searches for potential hazardous materials. The IWP Program is the program evaluated in this EIR; it will hereafter be referred to as the Program.

2.2 CEQA PROCESS

2.2.1 Notice of Preparation and Public Scoping

The City circulated the Notice of Preparation (NOP) for the proposed Program to local, state, and federal agencies and other interested parties on November 1, 2003, pursuant to *CEQA Guidelines* Section 15082. The NOP provided a description of the proposed Program and its location and identified probable environmental effects that would occur with implementation of the proposed Program. An initial study was not prepared, as a preliminary screening of environmental effects was completed as part of the IWP. Based on that screening, the City decided to prepare an EIR.

CEQA encourages the lead agency to conduct early consultation with any person or organization that may have concerns regarding the environmental effects of a project. In particular, it specifies that where scoping is used, it should be combined with the NOP process. A scoping meeting for the IWP was held at the Community Room of the Santa Cruz Police Building on November 13, 2003 to present the proposed Program to the general public and to receive public input regarding the proposed scope of analysis.

In addition to the scoping meeting, the City held early consultation meetings with public agencies regarding the proposed Program. These agencies included Soquel Creek Water District (SqCWD), University of California–Santa Cruz (UCSC), Department of Health Services (DHS), Regional Water Quality Control Board (RWQCB), Monterey Bay National Marine Sanctuary (MBNMS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and California Coastal Commission (CCC).

A variety of issues and concerns was raised during the 30-day scoping period, which ended on December 1, 2003, for the IWP Program . The general issues raised and where they are addressed in this EIR are presented in Table 2-1.

Table 2-1
Issues Raised During the EIR Public Scoping Period

GENERAL ISSUES RAISED	EIR SECTIONS ADDRESSING THESE ISSUES
Characterization of the Program (seawater intake, desalination treatment process, construction scenario, etc.)	Chapter 4, Program Description
Groundwater pumping effects to Purisima Aquifer	Localized and regional pumping effects evaluated in Section 5.1, Hydrology and Water Quality. Cumulative effects evaluated in Chapter 7, Cumulative Impacts.
Localized and regional environmental effects from groundwater pumping (impacts to biological resources, streams; saltwater intrusion; subsidence)	Section 5.1, Hydrology and Water Quality (for discussions of saltwater intrusion, streamflow level, and subsidence) Section 5.4, Biological Resources (for discussion on pumping effects to biological resources)
Effects on water quality from concentrate discharge	Section 5.1, Hydrology and Water Quality
Marine resources – impingement/entrainment	Section 5.2, Marine Resources
Water quality of treated water	Section 5.9, Public Services and Utilities
Effects on recreation/public access	Section 5.3, Land Use, Planning, and Recreation
Effects on visual resources	Section 5.10, Aesthetics/Visual Resources
Potential for growth	Chapter 6, Growth Inducement and Secondary Effects of Growth
Cumulative effects (construction, energy, etc.)	Chapter 7, Cumulative Impacts
Alternatives of and to the Program	Chapter 8, Alternatives to the Proposed Program

Some comments received during the NOP public scoping period did not relate to the proposed Program (e.g., reevaluation of the IWP), and some could not be adequately evaluated in this EIR due to the lack of available information or the speculative nature of the environmental effects (e.g., alternative energy supply). Where feasible, these issues are analyzed on a qualitative level. Where evaluation was not possible, these impacts are described in Chapter 1, Summary, under "Issues to be Resolved" and "Areas of Controversy."

2.2.2 Draft Program EIR and Public Meeting

As required by *CEQA Guidelines* Section 15120, this Draft EIR includes a summary, program description, characterization of the environmental setting, evaluation of potential environmental impacts resulting from implementation of the proposed Program, mitigation measures to reduce potentially significant impacts, and a discussion of the range of reasonable alternatives to the proposed Program. The Draft EIR is intended to inform the public of the potential impacts or benefits that would result from implementation of a proposed Project . Therefore, this document includes a set of significance criteria for each issue area by which proposed Program effects have been determined and appropriate mitigation measures developed. Impacts of the proposed Program are characterized before and after mitigation measures as follows:

- Significant and unavoidable (no feasible mitigation measures are available to reduce impacts to less-than-significant levels)
- Potentially significant but mitigable (mitigation measures included to reduce impacts to less-than-significant levels)
- Less than significant (no mitigation measures are required)
- No impact

CEQA requires that a distinction be made between those mitigation measures that are included in the proposed Project and those that could reasonably be expected to reduce adverse impacts if required as a condition of project approval. All mitigation measures presented in this EIR will be implemented if required to reduce potential impacts to less-than-significant levels. Compliance would occur through implementation of a mitigation monitoring and reporting program.

In accordance with *CEQA Guidelines* Section 15087, this EIR is circulated to local, state, and federal agencies, as well as interested organizations and individuals that may wish to review the document, during the 45-day comment period. The comment period is initiated upon receipt of the document by the Governor's Office of Planning and Research, State Clearinghouse, the entity in charge of compiling all environmental documentation for projects that involve state agencies. The Notice of Availability (NOA) is published in a newspaper of general circulation within the proposed Program area to notify the public that the EIR is available for review, either at the lead agency's administrative offices or at specified libraries. The NOA also invites the public to an informal meeting to hear about the proposed Program. The City will hold a public meeting to provide the public with an opportunity to comment on the EIR during the Draft EIR review process.

Written comments may be addressed to the following:

Linette Almond, Deputy Director
Santa Cruz Water Department
809 Center Street, Room 102
Santa Cruz, CA 95060
email: lalmond@ci.santa-cruz.ca.us
(clearly marked “IWP EIR comments” in subject line)

2.2.3 Final EIR and Findings

Written and oral comments received during the public comment period will be addressed in a Response to Comments document, prepared based on the requirements identified in *CEQA Guidelines* Section 15132. This document, in combination with the Draft EIR, will constitute the Final EIR. Lead agencies may provide an opportunity for review of the Final EIR by the public or by the commenting agencies before approving the project.

Prior to the City Council taking action on the Program, the City is required to prepare a written Findings for the Program. CEQA requires that, where one or more significant environmental effects of a project have been identified in the EIR, a written findings consisting of a brief explanation of the rationale for each finding be prepared.

2.2.4 Mitigation Monitoring and Reporting

State law requires lead agencies to adopt a mitigation monitoring and reporting program for the changes to the project it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment. All measures adopted by the City will be included in a mitigation monitoring and reporting program to verify compliance.

2.2.5 Lead Agency Action and Statement of Overriding Considerations

After reviewing the Final EIR and in conjunction with making findings, the Santa Cruz City Council will then consider EIR certification, adoption of the mitigation monitoring and reporting program, and approval of the IWP Program at a regularly scheduled City Council meeting.

When the lead agency approves a project that will result in significant effects that cannot be avoided or substantially lessened, the agency shall state in writing the specific reasons to support its action based on the Final EIR and/or other information in the record. The statement of overriding considerations shall be supported by substantial evidence in the record (*CEQA Guidelines* Section 15093).

2.3 SUBSEQUENT ENVIRONMENTAL DOCUMENTATION

As engineering design of the desalination plant and associated components proceeds, more detailed information would be available to facilitate the preparation of a project-level EIR for the first increment ("2005") of the 2.5 million-gallon-per-day (mgd) desalination plant. Subsequent project-level environmental review would assess site-specific impacts of the plant design, provide details of a pipeline route and right-of-way if necessary, re-evaluate the growth projections, confirm the timing and level of expansion for the next increment of water supply, and readjust the capacity and timing of the future expansion. Currently, expansion to 3.5 mgd and 4.5 mgd is expected to occur in 2015 and 2025. Construction of the desalination plant would not proceed until a project-level EIR for the desalination plant has been prepared and approved by the Santa Cruz City Council.

2.4 DOCUMENTS INCORPORATED BY REFERENCE

In accordance with *CEQA Guidelines* Section 15150, an EIR may incorporate by reference all or portions of another document that is a matter of public record or is generally available to the public. The EIR must state a public place where the incorporated documents will be available for inspection. The following documents, incorporated by reference, are the building blocks of the *IWP*:

1. *City of Santa Cruz Integrated Water Plan, Draft Final Report,* Gary Fiske & Associates, June 2003.
2. *Santa Cruz Water Department Water Curtailment Study Final Report,* Gary Fiske & Associates, February 2001.
3. *2000 Urban Water Management Plan,* City of Santa Cruz Water Department. January 2001.
4. *Santa Cruz Water Department Water Conservation Plan Final Report,* Gary Fiske & Associates, February 2000.
5. *City of Santa Cruz Water Demand Investigation,* Maddeus Water Management, March 1998.
6. *City of Santa Cruz Alternative Water Supply Study, Technical Memorandum No. 5, Water Supply Alternatives,* Carollo Engineers, November 2000.
7. *City of Santa Cruz /Soquel Creek Water District Alternative Water Supply Study, Evaluation of Regional Water Supply Alternatives, Final,* Carollo Engineers, March 2002.

These documents are available for review during regular business hours at the Santa Cruz Water Department administrative office at 809 Center Street, Room 102, Santa Cruz, CA 95060.

2.5 ORGANIZATION OF THIS REPORT

This document has been prepared to provide a comprehensive analysis of the IWP. Chapter 3 provides a background of efforts that led to the proposed Program evaluated in this EIR. Chapter 4 describes the three elements of the proposed Program: conservation, curtailment, and supplemental water supply. The implementation of these components is analyzed in Chapter 5, based on the following issue areas:

5.1 Hydrology and Water Quality
5.2 Marine Resources
5.3 Land Use, Planning, and Recreation
5.4 Biological Resources
5.5 Air Quality
5.6 Noise
5.7 Geology and Soils
5.8 Cultural Resources
5.9 Public Services and Utilities
5.10 Aesthetics/Visual Resources
5.11 Hazards and Hazardous Materials
5.12 Traffic and Transportation
5.13 Energy

Chapter 6 provides a discussion of the potential for the proposed Program to result in growth inducement and secondary effects of growth. Chapter 7 discusses the potential for cumulative impacts associated with the implementation of the proposed Program in combination with other projects. Chapter 8 evaluates the alternatives to the Program. The lead agency and report preparers are presented in Chapter 9.

Chapter 3 Background

3.1 PROGRAM LOCATION

The City of Santa Cruz water system is a municipal utility that provides water service to 90,000 people in the City of Santa Cruz, portions of unincorporated Santa Cruz County, a small part of the city of Capitola, and several agricultural customers along Highway 1 between the City limits and the town of Davenport. The City is located on the central coast of California along the northern end of Monterey Bay (Figure 3-1). The geographic area served by the water system is illustrated in Figure 3-2.

3.2 DESCRIPTION OF THE WATER SUPPLY SYSTEM

The Santa Cruz water system is comprised of four main sources of supply:

- North Coast sources (including Laguna, Majors and Reggiardo Creeks, and Liddell Spring),
- San Lorenzo River (including Tait Street Diversion, Tait wells, and Felton Diversion),
- Loch Lomond Reservoir, and
- Live Oak Wells.

The water system relies entirely on rainfall, runoff, and groundwater infiltration occurring within watersheds located in Santa Cruz County. The system is completely isolated in that there are no facilities in place to transfer water to the City system from adjacent water districts, nor is any water purchased or imported to the region from outside the Santa Cruz area.

On average, about 75 percent of the City's annual water supply needs are met by surface diversions from the coastal streams and the San Lorenzo River. The yield of these flowing sources in any given year is directly related to the amount of rainfall received and runoff generated during the previous winter season. Water stored in Loch Lomond Reservoir is used mainly in the summer and fall months when the flows in the coast and river sources drop off and additional supply is needed to meet higher daily demands in the peak season. Loch Lomond use accounts for only about 20 percent of the City's average annual supply, with the remaining 5 percent produced from the Live Oak Wells.

3.3 OVERVIEW OF WATER SUPPLY PROBLEM

The primary water management problem presently facing the City of Santa Cruz is the lack of adequate water supply during periods of drought.

In normal and wet years when rainfall and runoff are normal to abundant, base flows in the coast and river sources are restored by winter rains. Storage in Loch Lomond is typically replenished to full capacity with runoff from the Newell Creek watershed and water diverted from the San Lorenzo River at Felton. Under these weather conditions, the water supply system is capable of meeting the community's total annual water requirements.

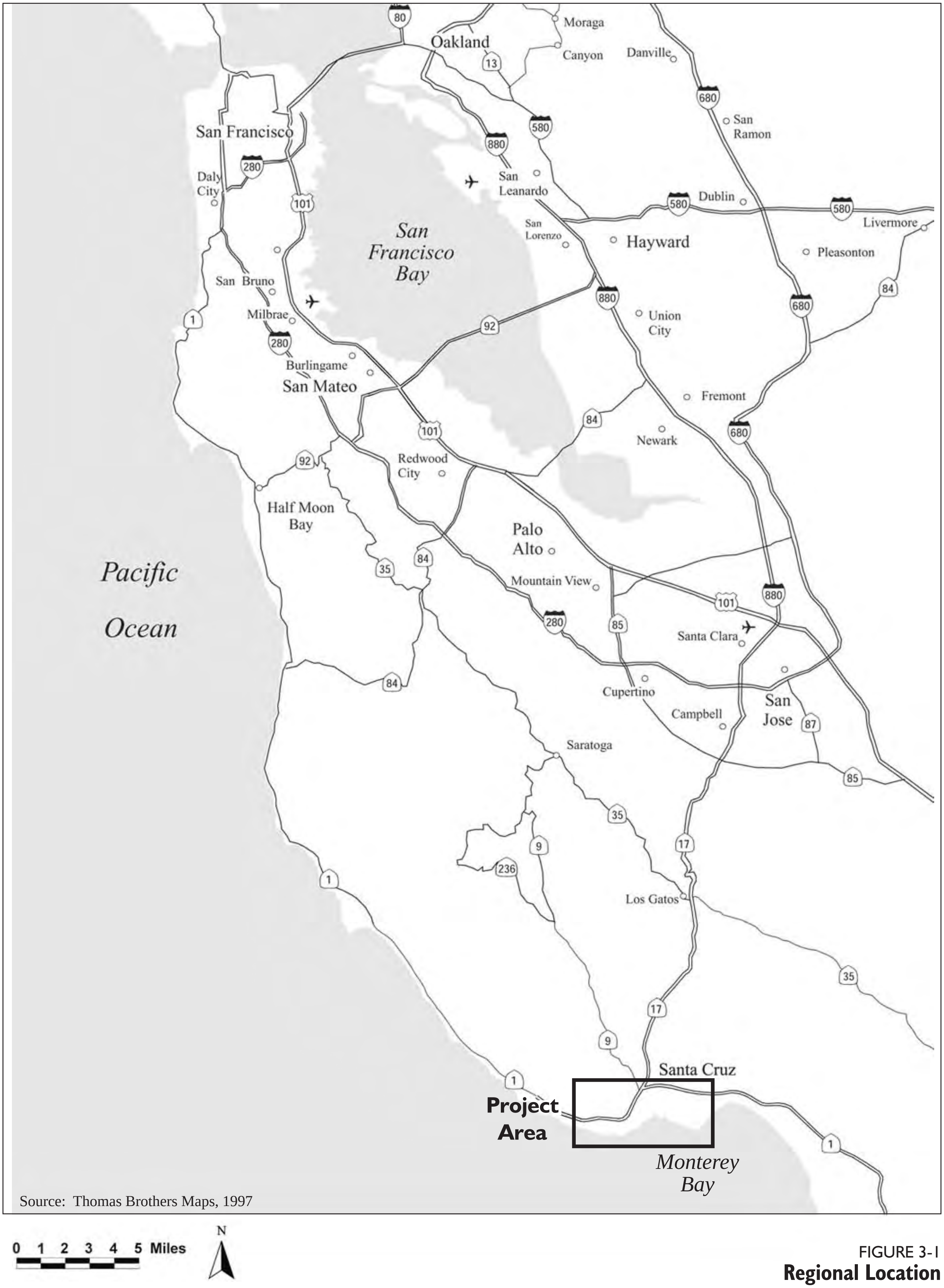
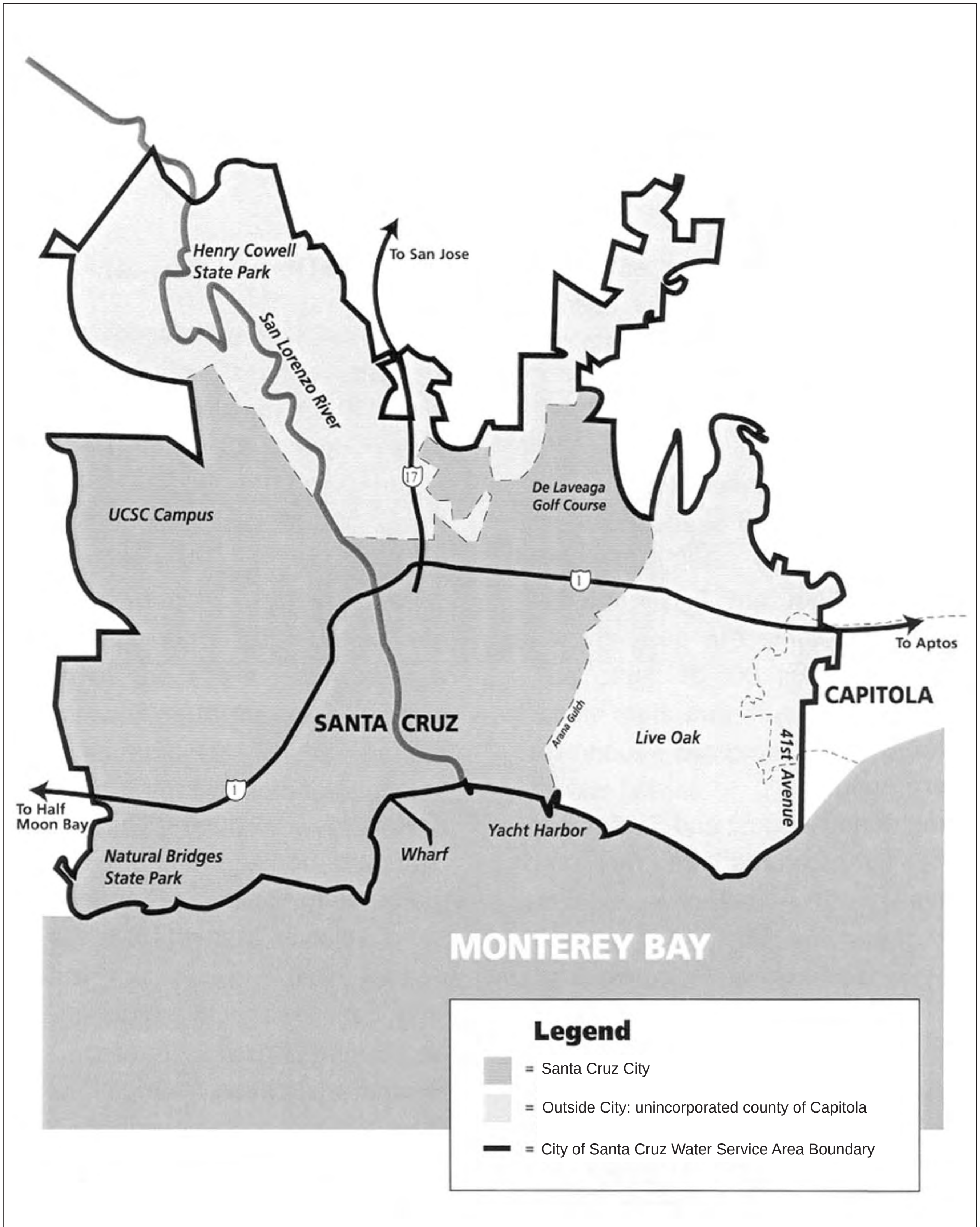


FIGURE 3-1
Regional Location



Source: SCWD, 2000 Urban Water Management Plan, January 2001

FIGURE 3-2

City of Santa Cruz Water Department (SCWD) Service Area

The system is highly vulnerable to shortage in below normal, dry, and drought years, however, when the San Lorenzo River and coast sources run low. In these year types, the system relies more heavily on water stored in Loch Lomond to satisfy demand, which draws down the reservoir level lower than usual and depletes available storage. In critically dry or multi-year drought conditions, the combination of very low surface flows in the coast and river sources and depleted storage in Loch Lomond reservoir reduces available supply to a level that cannot support even average dry season demands.

The City experienced severe water supply deficiencies in both the 1976-77 and 1987-92 droughts. In 1977, the City imposed severe water rationing in response to a critical shortage of water. During the 1987-92 drought, a water supply emergency was declared and either usage restrictions or rationing was imposed each year for five consecutive years. The 1976-77 event has since been established as the most severe drought of record, and is used by the City as a benchmark for assessing system reliability. If a critical drought similar to 1976-77 occurred in 2005, shortages would be in excess of 40%.

Operations studies conducted by the City show that the problem of water shortage will worsen, in terms of both frequency and magnitude, as the population of the region grows and demand for water increases over time.

3.4 INTEGRATED WATER PLAN – BACKGROUND STUDIES

The City has been actively considering possible new water supplies for many years in order to address the problem of water shortage and to plan for future growth. Past efforts to augment water sources have made little progress, however, due to stakeholder disagreement on the appropriate course of action.

In 1997, the City initiated a new effort using a broader-based approach known as integrated water planning to consider all practical options for decreasing demand and increasing supply. As part of this effort, a series of background studies were undertaken, including the following.

- Water Demand Investigation (Maddaus Water Management 1998)
- Water Conservation Plan (Gary Fiske & Associates 2000)
- Water Curtailment Study (Gary Fiske & Associates 2001)
- Alternative Water Supply Study (Carollo Engineers November 2000).
- Evaluation of Regional Water Supply Alternatives (Carollo Engineers March 2002)

The purpose and findings of these background studies are summarized below.

3.4.1 Water Demand Investigation

The objectives of the Water Demand Investigation were to update a previous water demand projection made a decade before, to extend the planning horizon to 2020, and to develop a forecast of ultimate water demand at buildout.

The latest information on local population and employment trends, published in 1997 by the Association of Monterey Bay Area Governments, was used to develop the forecast. Water use was analyzed for each of 12 customer categories (i.e., single-family residential, multiple-family residential, business, industrial, municipal, etc.) to determine average water use per account. Future water demand was derived by multiplying the values for per-account water use by the expected number of accounts in each customer category. The results were then added together, along with an allowance for unaccounted-for water, to produce a projection of total future water demand in five-year increments. Finally, a downward adjustment was made to take into account the impact of low-flow plumbing fixtures on future water demand in both new and existing buildings.

The study projected that water demand would rise from about 4.4 billion gallons per year in 1997 to just under 5.2 billion gallons per year in 2020. This equates to a 17 percent increase over a period of 23 years. The study also provided an estimate of the City’s water needs at buildout, a condition reached when all land in the service area has been developed to its theoretical capacity under current planning and zoning regulations. Total annual water requirements at buildout, which was informally considered to be the year 2040, was estimated at 5.5 billion gallons.

3.4.2 Water Conservation Plan

In 1997, the City undertook a comprehensive study of water conservation. The specific goals of the study were to determine which conservation programs were most cost-effective and best-suited to the City’s customer base, to identify the potential water savings those programs could achieve and the costs of implementation, and to develop an action plan to guide the City’s efforts in the areas of water conservation through 2010.

Water conservation measures can be employed on a long-term basis to alleviate the need for new water sources and on a short-term basis in response to a temporary water shortage or drought emergency. The focus of the City’s water conservation plan is on measures that reduce average daily water consumption on a long-term basis. Accordingly, emphasis was placed on water-efficient technologies, plumbing fixtures, appliances, and landscaping improvements for which quantifiable and reliable projections of water savings could be made, and measures with lasting water savings.

The process for developing the conservation plan involved analyzing water use in each customer category (i.e., residential, commercial, industrial, irrigation); identifying and screening possible new conservation measures for costs, water savings, and appropriateness for the Santa Cruz area; formulating program alternatives by selecting the most promising measures and then determining how they would best be delivered to water users; developing conservation pricing options; and evaluating, selecting, and prioritizing the programmatic and pricing options to develop an action plan. The alternatives were prioritized by rating them against evaluation criteria, including conservation savings, program cost, implementation feasibility, public acceptability, and shortage management impacts.

The resulting Water Conservation Plan consists of a series of programs or best management practices that reduce average daily water use on a long-term basis, including financial incentives, new regulations, and water audits for high-use customers. The programs address the predominant end uses of water, including toilets, clothes washers, showers, faucets, and landscaping in the residential sector, and the principal indoor and outdoor uses of water in the nonresidential sector. Overall, the Water Conservation Plan estimated that, by 2010, total savings from all of the programs would amount to nearly 300 million gallons per year.

The conservation plan recognized that the City would need to impose mandatory water restrictions and/or rationing again when another drought occurs. It was developed with the intention of incorporating the findings into the IWP, thus recognizing the critical interrelationship between long-term use reduction and drought management.

3.4.3 Water Curtailment Study

As early as 1997, the City acknowledged that it was willing to accept some level of planned curtailment as a way of minimizing the expense and environmental impact of developing a new source of supply. Rather than building a project so large that it would eliminate the possibility of a future shortage, the City's approach was to accept some risk of shortage as a tradeoff to reduce the amount of new supply needed.

The purpose of the Water Curtailment Study was to characterize the economic and noneconomic impacts that different levels of water shortage impose on municipal water customers. The intent was to provide decision-makers with an understanding of the hardships that City customers would face in assessing the public policy tradeoffs of alternative water supply strategies.

The study examined six hypothetical drought scenarios ranging from a mild 10 percent seasonal shortage to an extreme 60 percent deficit in water supply. To assess how the impacts would differ among the City's six largest customer groups, available water supplies were allocated in accordance with the priorities established in the City's drought contingency plan. The uses of water related to health and safety were given the highest priority and assumed to be cut back the least in a water shortage. Business uses were assigned an intermediate priority. Landscape irrigation was afforded the lowest priority and was cut back the most. Interviews, focus groups, and surveys were employed to research the likely actions each group of customers would take if required to curtail their water use by a specified amount and to determine the effects of those actions on their lifestyle or business operation.

The findings show how the potential impacts and degree of hardship grow as the level of shortage increases. For residential customers, milder shortages would result primarily in inconvenience, while more severe shortages would result in economic, aesthetic, or health and safety impacts. Economic impacts of water shortages on business and industrial customers were seen to vary widely. Among the most significantly affected sectors were the landscape industry and the hospitality industry (including restaurants, hotels, and visitor-serving businesses), which depend on summer revenues. Customers with extensive landscaping would experience the largest cutbacks of any class due to the low priority afforded outdoor water use in a drought. As a result, these customers are expected to suffer large losses even during relatively moderate water shortages.

3.4.4 Alternative Water Supply Project/Regional Water Supply Alternatives

The objective of the Alternative Water Supply Study was to identify and evaluate several water supply alternatives to meet the City of Santa Cruz's current and future water demands. This study conceptually described and evaluated the engineering feasibility of five potential supply sources, including groundwater development of the Santa Margarita and Purisima Aquifers, maximization of existing water sources and storage, desalination, and reclamation.

The study did not rank and prioritize the alternatives, but deferred to the IWP, which identified a preferred approach. However, a number of issues related to each alternative were identified, including the limited supply and reliability of groundwater; the insufficient supply from maximizing existing sources and storage despite the operational improvements that would occur; the potentially lengthy and rigorous permitting and environmental impact process for desalination; and the need for contractual agreements with North Coast property owners (e.g., California Department of Parks and Recreation) and farmers for water reclamation and exchange.

Two of the alternatives developed in the 2000 study, cooperative desalination and wastewater reclamation, were expanded upon in the Evaluation of Regional Water Supply Alternatives (Carollo 2002). This study evaluated the opportunities and constraints of using the desalination or reclamation plant to supply water to both the City and a potential partner, SqCWD. The alternatives identified in this study were then carried forward into the IWP process for further evaluation.

3.5 INTEGRATED WATER PLAN PROCESS

Work on the IWP began in March 2001 and was overseen by the City's Integrated Water Plan Committee (IWPC), which included three members of the Water Commission, three members of the City Council, and one ex-officio member. The IWPC reviewed all documents and public meeting materials, provided key input at every stage of the IWP process, and met regularly with staff and consultants on a bi-weekly basis. All meetings were open to the public; in addition, two public workshops were held to educate the public and answer questions and concerns.

The process of developing the IWP involved the following steps:

- Formulation of objectives
- Development of a computer modeling tool to analyze and compare alternative strategies
- Definition of the model's "base case," which included current supplies and infrastructure as well as those system enhancements that would be made independent of the IWP, and assessment of shortages that City customers would experience under such base case conditions
- Identification and characterization of the City's conservation, curtailment, and supply options

- Development and refinement of evaluation criteria (e.g., economic, environmental, and institutional)
- Development of alternative resource strategies
- Evaluation of the strategies against the evaluation criteria and recommendation of preferred strategies
- Description of the key steps for implementation of the preferred strategies

3.5.1 IWP Objectives

The IWP objectives are to: (1) reduce near-term drought shortages, and (2) provide a reliable supply that meets long-term needs while ensuring protection of public health and safety (Gary Fiske & Associates 2003). The near-term goal would reduce the level of curtailment needed in a 1976-77 type drought in excess of 40 percent down to no more than 25 percent, while the long-term goal would maintain that same level of drought protection and provide supply for planned growth through the year 2030.

3.5.2 Development of Operations Model

The next step in the IWP process involved the development of a computerized model of the water system, which simulated the operations of the existing water system over a 59-year historical hydrologic period, under both current and future demand conditions. The model was used to characterize the system's vulnerability to drought and to examine the tradeoffs of supplemental supply alternatives.

The output of this modeling effort showed that the City's water supply system is grossly inadequate to meet current demand under severe drought conditions. Specifically, it concluded that:

"With current supplies and facilities, if a drought comparable to the 1976-77 event occurred today, the City would experience a 45% peak season shortage in the second year of that event."

Figure 3-3 illustrates how existing water supplies would fall far short of meeting current demand in the dry season under worst case (1977) hydrologic conditions.

In the future, the operations model indicates that the supply problem will be worse as demand grows. Moreover, shortages of less than 10% are likely to be experienced much more frequently, even under average weather and water conditions.

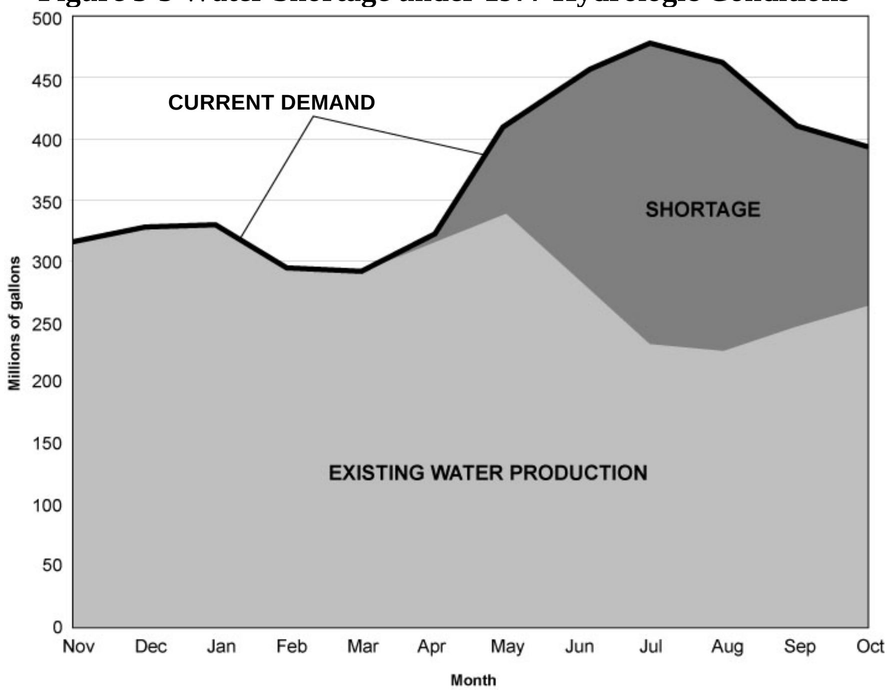
3.5.3 Formulation of Strategies

The water resource strategies developed in the IWP were made up of three primary building blocks, or components, as discussed below.

Conservation

Every strategy considered in the IWP included as a common building block the complete set of programs identified in the Water Conservation Plan (Gary Fiske & Associates 2000). The plan is expected to reduce customer demand for water by almost 300 million gallons per year in 2010, or by about 0.8 million gallons per day.

Figure 3-3 Water Shortage under 1977 Hydrologic Conditions



Source: Gary Fiske & Associates 2003

During the course of the IWP, additional programs beyond those recommended in the Water Conservation Plan were evaluated. These programs were later dropped from consideration because the potential yield for long-term, reliable savings was found to be very low.

In 2001, the City became a signatory to the Memorandum of Understanding Regarding Urban Water Use in California and is committed to implementation of 14 water conservation best management practices over the next ten years, many of which are covered in the Water Conservation Plan. In addition, state law requires review and update of the City's Urban Water Management Plan every five years, during which any new initiatives in the field of water conservation are considered.

Curtailment

Based on a review of the findings of the Water Curtailment Study (Gary Fiske & Associates 2001), the IWP recommended that the City's water plan limit any future shortage to no more than 25 percent in order to protect customers from undue hardships associated with severe water shortages. This objective was used to guide decisions about the size and timing of strategies aimed at reducing the City's potential worst-case deficit from 45 percent to 25 percent or lower, and to maintain at least that level of water supply reliability through 2030.

The IWP considered a range of "curtailment profiles" to examine the tradeoffs among these strategies. A curtailment profile refers to the minimum level of supply reliability a particular strategy is designed to achieve over the planning period. Each strategy was configured to achieve three profiles:

- Curtailment Profile 1: No water shortage (perfect reliability)
- Curtailment Profile 2: Worst-case peak-season shortage of 15 percent
- Curtailment Profile 3: Worst-case peak-season shortage of 25 percent

In terms of impacts to customers, Curtailment profile 1 would impose no hardship, Curtailment profile 2 would require periodic watering restrictions on outdoor usage, and Curtailment profile 3 would require more frequent restrictions than profile 2 as well as water rationing under the worst case conditions.

The strategies were then evaluated at each of these three curtailment profiles to consider the tradeoffs and to identify a preferred solution.

Water Supply

The water supply options formulated in the IWP are a distillation of a larger number of projects rejected or advanced in the past on the basis of their feasibility and consensus-building merits. By the time the IWP analysis began, the only supply augmentation projects that were considered viable included:

- Seawater Desalination
- Reclamation/Groundwater Exchange on the North Coast
- Santa Margarita Aquifer at Live Oak
- North Coast Upgrades
- Coast Pump Station Upgrades
- Treatment Upgrades

Numerous modeling runs were undertaken to evaluate the effectiveness of the last three projects, which found that they would have an insignificant impact on the size of the drought curtailments. Thus, since they did not meet the overall purpose and need of the IWP, they were eliminated from further consideration.

Eight resource strategies, defined as a combination of conservation and supply options designed to maintain a particular curtailment profile through the planning period, were formulated. These strategies were all based on two categories of primary water supply source: Desalination or Reclamation/Groundwater Exchange.

Desalination Strategies:

D-1: City-only Desalination
D-2: Cooperative Desalination
D-3: City-only Desalination and Santa Margarita Groundwater
D-4: Cooperative Desalination and Santa Margarita Groundwater

Reclamation/Groundwater Strategies:

R-1: City-only Reclamation/Coast Groundwater
R-2: Cooperative Reclamation/Coast Groundwater
R-3: City-only Reclamation/Coast Groundwater and Santa Margarita Groundwater
R-4: Cooperative Reclamation/Coast Groundwater and Santa Margarita Groundwater

By combining the eight strategies with the three curtailment profiles (0, 15, and 25 percent) the capacity and timing of new supply increments needed from 2005 through 2030 was determined.

3.5.4 Evaluation of Water Resource Strategies

The evaluation criteria used in the IWP process to compare and contrast the various strategies were as follows:

- Cost (total utility revenue requirements over the planning period, average monthly water bill increases experienced by a “typical” residential customer, total required City capital investment through 2010)
- Curtailment profile (frequency of total peak-season shortages of selected sizes, size of worst total peak-season shortage, frequency of multi-day shortages of selected sizes, and size of worst multi-day shortages)
- Vulnerability to external events (expected average daily shortage resulting from a two-day loss of either the Graham Hill Water Treatment Plant (WTP) or the Newell Creek Pipeline, and expected added seasonal shortage resulting from regulatory changes)
- Environmental impacts (with respect to marine resources, land use, traffic, recreation, visual resources, hydrology (surface water and groundwater), public health and safety, fisheries, wetlands, wildlife and plants, cultural resources, air quality, and noise)
- Energy consumption (expected total energy usage over the planning period to provide water to City of Santa Cruz customers)
- Impacts on Purisima aquifer (improvement, no change, or degradation to the aquifer)
- Ease of implementation (ordinal ranking of strategies in terms of overall expected implementation difficulty)

The final step of the IWP was to evaluate the strategy, including the distinctions among curtailment profiles and between City-only and cooperative strategies. The results of the analysis are provided in the IWP and are summarized below.

Curtailment Level

It was determined that Curtailment Profile 2 (maximum 15 percent drought-year shortages) would provide the best cost-reliability tradeoff for Santa Cruz water customers.

Santa Margarita Aquifer at Live Oak

Development of the Santa Margarita aquifer at Live Oak was found to not significantly improve performance against any criterion and would increase hydrogeologic impacts. Therefore, it was concluded that development of the Santa Margarita aquifer at Live Oak should not be undertaken as part of the IWP.

City-only vs. Cooperative Strategies

It was determined that cooperative strategies would provide financial savings and help preserve the Purisima aquifer at Live Oak. However, because cooperative strategies would be more complex to implement and there was concern over growth-inducement issues, no conclusion was drawn regarding the relative merit of a cooperative strategy versus a City-only strategy.

Desalination vs. Reclamation/Groundwater Exchange

Even though desalination was found to be slightly more costly and was found to have a greater impact on the marine environment than reclamation, it performed better in all the other evaluation categories. Toward the end of the planning process, though, the reclamation/groundwater exchange alternative was deemed infeasible as a result of the California Department of Parks and Recreation stating its position against the concept in writing, which effectively left the City with only one viable supply option to pursue – desalination.

3.6 INTEGRATED WATER PLAN RECOMMENDATIONS

Based on the process described above, the IWP identified two desalination strategies: D-1 (City-only Desalination) and D-2 (Cooperative Desalination) at 15 percent curtailment as the two preferred alternatives. Because there were no clear advantages to either D-1 or D-2, the decision was made to defer selecting one or the other as the final preferred strategy until the completion of this EIR.

3.7 ONGOING PLANNING ISSUES

A basic assumption made in developing the IWP was that the City would continue to use its existing sources of supply into the future as it has in the past. There are, however, a series of ongoing challenges facing the City over its existing sources that potentially could lead to some loss of supply in the future, although it is uncertain to what extent and which supplies might be impacted.

Continued access to the same amount of supply from the north coast sources will depend on the outcome of a Section 10 permit application and accompanying habitat conservation plan for city activities that ultimately must be approved by the U.S. Fish and Wildlife Service, NOAA Fisheries, and California Department of Fish and Game. These agencies have authority under the federal and state Endangered Species Act to regulate projects that are likely to affect species listed as threatened or endangered. The City is also in the process of rehabilitating the North Coast raw water pipelines and diversions to reduce losses due to leakage or structural failure. The project is under a separate CEQA review process and construction will likely take place over the next 15 – 20 years. While the water supply planning that led to the IWP program is based on reducing leakage on the North Coast Pipeline, the City must pursue rehabilitating the system to provide a reliable supply into the future regardless of the outcome of the IWP.

The City is also in the process of developing and submitting filings to the State Water Resources Control Board to rectify a historical technical deficiency in the water rights on Newell Creek and the San Lorenzo River (at Felton), and to extend the time within which the City can put water to full beneficial use on its permits for diversion to storage on the San Lorenzo River in Felton. Based upon the original filings, which were thought to be adequate due to the anticipated use of Loch Lomond storage reservoir, these water rights allow only for diversion to storage and not for direct diversion. This circumstance makes the water supply technically unavailable as a source for City use during times when, for example the reservoir is receiving more inflow from Newell Creek than is released downstream. The water rights filings are intended to correct this historical deficiency and bring the water rights and current operations into conformance. The City will ensure CEQA compliance for these actions, which are independently required and useful to perpetuate the City's ability to use these sources on an ongoing basis.

Finally, the ability to produce water from the Live Oak wells, in drought years and potentially all years, may be compromised by continued deterioration of groundwater basin conditions due to region-wide over pumping of the Purisima aquifer (see Section 5.1 and Appendix C). The City is currently in the process of rehabilitating its wells and treatment plant to their original capacity of 2 mgd. Any or all of these challenges could lead to some loss of existing water supply that would, in turn, affect the recommendations in the IWP about the capacity and the timing of the recommended desalination strategies in future years.

A description of these projects are provided below.

3.7.1 City of Santa Cruz Section 10 Permit Program

The City of Santa Cruz provides essential local government services for its citizens and visitors, such as water supply, waste management, storm water management, recreation, and open space. To ensure the City's ability to provide services to the community currently, and in the future (e.g., next 30 years), the City is undertaking a Section 10 Permit Program pursuant to the Federal Endangered Species Act (FESA) and Section 2081 of the California Endangered Species Act (CESA). FESA and CESA require parties that engage in activities that are likely to result in take of listed species to obtain incidental take mitigations. The Habitat Conservation Plan (HCP) will address the potential effects of a range of City activities conducted by the Water Department, Parks and Recreation Department, and Public Works Department on listed species.

The HCP covers a range of City activities and facilities and including the City's surface water diversion facilities, pipelines, open spaces, parks, and other public areas operated within the City limits. The HCP addresses effects on species that are currently listed as threatened or endangered under FESA or CESA, or are considered sensitive at the state or federal level, and are potentially found in the HCP area. The covered species include four fish species (i.e., steelhead trout, coho salmon, tidewater goby and Pacific lamprey), one amphibian (i.e., California red-legged frog), one reptile (i.e., southwestern pond turtle), four avian species (i.e., brown pelican, Western snowy plover, osprey and marbled murrelet), two invertebrate species (i.e., Ohlone tiger beetle and Mount Herman June beetle), and four plant species (i.e., Point Reyes horkelia, Robust spine flower, Santa Cruz tar plant, and San Francisco Popcorn flower).

The goal of the HCP is to minimize and mitigate to the maximum extent practicable the effects of City activities on listed and other sensitive species. The conservation measures associated with the HCP may result in changes in the City's operation and management activities and potentially affect the timing and use of the City's existing water supply. However, the effect, if any, on the City's water supply is yet to be determined. The City will ensure CEQA compliance for this action, which is independently required and useful to perpetuate the City's ability to use these sources on an ongoing basis.

3.7.2 North Coast System Rehabilitation Project

The North Coast System (NCS) Rehabilitation Project would replace, rehabilitate or repair portions of the water diversion and delivery infrastructure that make up the NCS. The NCS has been significantly impacted by aging materials and out-dated design. Much of the original NCS was constructed in the mid to late 1890's. Significant water use efficiencies can be affected at the four diversion facilities and along the 16+ miles of pipeline that would allow for enhanced water conservation. The NCS supplies approximately 25% of the City's water. NCS water receives first priority use among the City's various water sources, because the NCS does not have any water storage capacity. Therefore, any water that is not diverted for use is lost from the system.

The NCS includes diversion facilities located on the East Fork of Liddell Creek, Reggiardo Creek, Laguna Creek and Majors Creek. Water is passively diverted and conveyed by gravity through four pipeline reaches from the diversions to the North Coast Pipeline (NCP). The NCP runs along the Highway 1 corridor from Laguna Creek to the eastern extent of Wilder Ranch State Park. It then traverses several private and commercial properties, City Open Space, and runs through City streets to the Coast Pump Station located on River St. at the San Lorenzo River.

The project would modify the diversion structures on the Laguna Creek and Majors Creek facilities, and would replace each of the 5 pipeline reaches, over a 15 to 20 year period. Successful modification of the Laguna and Majors diversion structures would allow for the management of sediment transport in a manner more consistent with natural conditions by allowing sediment to pass unimpeded during peak flows. The modifications would allow for automated operations at these facilities, providing for more efficient and environmentally sensitive responses to changes in flow and suspended sediment load. Each pipeline reach will be replaced along the existing or an alternative alignment, rectifying existing leakage and similar inefficiencies. The City will ensure CEQA compliance for this project, which is independently required and useful to perpetuate the City's ability to use these sources on an ongoing basis.

3.7.3 Water Rights Conformance Proposal

The Water Rights Conformance Proposal seeks to add the right of direct diversion to the City's Newell Creek and San Lorenzo River at Felton water rights, rectifying an oversight in the original water right filings. License 9847 at Newell Creek Reservoir allows diversion to storage of up to 5,600 acre-ft per year (AFY) between September 1 and July 1. The Felton water rights allow diversion of up to 3,000 AFY to storage in the reservoir between September 1 and June 30th (Permit No. 16123) and October 1 to June 1 (Permit No. 16601).

The Water Rights Conformance filings would bring the historical operations of these diversions into compliance with water rights permitting requirements, rectifying an oversight in the original filings. The proposed direct diversion rights are limited to the same volume of water, purposes and places of use as the existing rights such that they match the existing rights to the extent possible while allowing direct diversion, consistent with historic practice. No new structures, construction activities, or land-uses are proposed for this action. The proposed changes would allow the City to maximize efficiency of water use, and does not seek an increase to the maximum quantities of the existing permitted and licensed water appropriations. Instead, the change is to allow a different method of diversion. The successful conclusion would allow the City to continue to operate the Newell Creek Diversion and Felton Diversion as integrated facilities in accordance with past and intended future practice. The City will ensure CEQA compliance for these actions, which are independently required and useful to perpetuate the City's ability to use these sources on an ongoing basis.

3.7.4 Felton Diversion Water Rights Time Extension Project

The City of Santa Cruz Water Department holds water right permits 16123 and 16601 to divert to storage up to 3,000 AFY from the San Lorenzo River at Felton. The City has been diligently putting water to beneficial use pursuant to these permits consistent with municipal water supply development requirements. To date, the City has used over half the permitted amount. The City expects to need the full amount in the future. The time to put water to full beneficial use under the permits is presently scheduled to expire ~~in~~ on December 31, 2006. The City is filing petitions with the SWRCB for extension of the time allowed for that purpose. The City manages its limited water supplies carefully to preserve water for droughts and plan for future demand in the water service area resulting from planned growth identified in the general plans for the City, County, and City of Capitola. The water supplies from the Felton Diversion are critical to meeting the projected future demand. They are also critical to the City's ability to meet water demand during operational outages, changes in operations in response to environmental concerns, and dry and drought periods. Therefore, the City is seeking extensions of the time allowed to put water to full beneficial use pursuant to the Felton water right permits. The City will ensure CEQA compliance for these actions, which are independently required and useful to perpetuate the City's ability to use these sources on an ongoing basis.

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Chapter 4 Program Description

4.1 PROGRAM COMPONENTS

4.1.1 Overview

As described in Chapter 3, the *Draft Final Integrated Water Plan* (IWP) concluded that conservation, 15 percent curtailment, and water supply development involving the construction of a 2.5-million-gallon-per-day (mgd) desalination plant (expandable to 4.5 mgd) would best achieve the Program objectives. These three components (described further in Table 4-1), in concert with the continuance of the City's existing water supply sources (the North Coast diversions, San Lorenzo River, Loch Lomond Reservoir, and the wells in the Live Oak area), thus provide a solution to the City's projected water shortages during droughts, while also providing for the community's water needs into the future.

The conservation component is a method for maximizing use of the existing sources, in all years, and for minimizing the amount of new water supply needed. The curtailment component is invoked in dry years when the flowing sources are at low levels and cutbacks are needed to preserve limited storage in Loch Lomond Reservoir. The desalination component bridges the deficit between existing supply sources in dry years and system demand.

For the desalination component, two operational strategies for the desalination plant were identified. Generally, Alternative D-1 would provide water supply during a drought to the City service area, and Alternative D-2 would continue to provide water to the City during droughts but would also provide water supply for its potential partner, Soquel Creek Water District (SqCWD), during nondrought periods. Facilities associated with the two operational alternatives would generally be the same, except that implementation of D-2 would require additional conveyance and pumping facilities. The components are described in Table 4-1.

4.1.2 Conservation

A cornerstone of the IWP is to achieve the maximum practical water-use efficiency through conservation. Both state water law and the City's General Plan call for a strong emphasis on water conservation and elimination of water waste to stretch existing supplies, to minimize the need for new water sources, and to protect the environment. The City is also a signatory to the *Memorandum of Understanding Regarding Urban Water Conservation in California* and is thus committed to the implementation of 14 water conservation best management practices, many of which are included in the City's *Water Conservation Plan*.

The Water Conservation Plan was adopted February 2000 by City Council, and directed staff to begin immediately with implementation of the plan. The *Water Conservation Plan* identified 11 new conservation programs to be implemented in sequence of priority between 2000 and 2006. A number

Table 4-1
City of Santa Cruz Integrated Water Plan Program EIR Components

PROGRAM COMPONENTS
Water Conservation – Reduce Overall Water Use In All Years Residential Programs: Ultra-low flush toilet (ULFT) rebates, high-efficiency clothes washer rebates, conservation kit distribution, plumbing fixture retrofit ordinance, residential water surveys, apartment building submeters, and new construction ordinance. Nonresidential Programs: Commercial ULFT rebates, large landscape water use review, parks water use review, large landscape budget-based rates, and commercial, industrial, and institutional water surveys.
Water Curtailment 15 percent reduction: Water management tool that would allow for reduction in drought shortage.
Water Supply – Desalination
<u>Alternatives D-1 and D-2 Facilities (Applicable to All Increments of both Alternatives)</u> ▪ ***Raw Water Intake and Appurtenances.*** Conversion of the City's existing emergency wastewater outfall for use as raw water intake; modifications to the existing junction structure at the beach near the intersection of West Cliff Drive and Sunset Avenue; pumping facilities at the raw water intake. ▪ ***Raw Water Pipeline.*** Raw water intake pipelines between the ocean and the desalination plant. ▪ ***Desalination Plant.*** 2.5-mgd desalination plant (expandable to 4.5 mgd), consisting of treatment, pumping, and storage facilities. ▪ ***Treated Water Distribution Pipeline.*** Treated water distribution pipelines from the desalination plant to Bay Street Reservoir. ▪ ***Concentrate Discharge Pipeline.*** Concentrate discharge pipelines between the desalination plant and the Santa Cruz City wastewater treatment plant (WWTP) or existing wastewater outfall. ▪ ***Concentrate Discharge Modifications.*** Modification of the City's existing wastewater outfall to accommodate concentrate discharge; modifications to the existing junction structure at the beach near the intersection of West Cliff Drive and Sunset Avenue. <u>General Alternative D-1 City-only Operation (Applicable to all Increments of this Alternative Only)</u> ▪ ***Nondrought.*** Desalination plant would not be in operation in first increment and could be operated for subsequent increments. ▪ ***Drought.*** Desalination plant would be operated to supplement the City's peak demands.
<u>Alternative D-2 Cooperative Facilities (Applicable to the First Increment of this Alternative Only)</u> ▪ See Alternative D-1 elements, above. ▪ **D-2 Conveyance Facilities and Appurtenances.** Pipelines between the City's service area and that of SqCWD; associated pump station(s); modifications to existing distribution systems to include interconnections, as necessary; potential upgrade of existing SqCWD pipelines. <u>General Alternative D-2 Cooperative Operation (Applicable to all Increments of this Alternative Only)</u> ▪ ***Nondrought.*** Desalination Plant would be operated (as determined by Operations Agreement between the City and SqCWD. ▪ ***Drought.*** SqCWD would not receive any water from the desalination plant, unless excess capacity is available.

Source: EDAW 2004

of programs have already been started. Implementation of these programs would result in an estimated annual savings of nearly 300 million gallons by 2010 (Gary Fiske & Associates 2003). These conservation programs are discussed below.

Residential Programs

Ultra-Low Flush Toilet Rebates

This rebate program, which began in 1995, offers a $75 rebate as a financial incentive for customers to remove their older, higher-volume toilets and replace them with 1.6-gallon flush ULFT. This program is ongoing.

High-Efficiency Clothes Washer Rebates

This rebate program, which began in 2000, offers a $100 rebate to residential customers who purchase approved water- and energy-efficient clothes washing machines. In September 2002, the City expanded the program by participating in a statewide program to provide rebates of up to $350 to laundromats, multifamily houses, institutional common-area laundry facilities, and businesses with on-premise laundry or coin-operated laundry facilities.

Conservation Kit Distribution

The City provided over 20,000 residential customers with free water conservation devices to retrofit interior plumbing fixtures and reduce indoor water use. These devices include: low-flow showerheads, faucet aerators, leak detection tablets for the toilet and instructions for performing leak detection tests, and informational materials. The program began and was completed in 2001. In 2002, this program was expanded to include requests from multifamily customers.

Plumbing Fixture Retrofit Ordinance

An ordinance requiring properties to meet efficiency standards for plumbing fixtures whenever a property changes ownership was presented to the Santa Cruz City Council and Santa Cruz County Board of Supervisors in December 2002, and adopted in 2003. The plumbing fixture retrofit program, which applies to all residential, commercial, and industrial buildings, has been in effect throughout the City’s service area since early 2003.

Residential Water Surveys

This voluntary program will allow a trained conservation professional to assess customers’ plumbing fixtures, irrigation, equipment and household use practices in order to provide site-specific water conservation recommendations. This program is under development and is scheduled to begin in May 2005.

Apartment Building Submeters

This program will provide a rebate to apartment owners to encourage the installation of submeters in existing apartment units, where a master meter already exists. Submeters measure individual dwelling unit water consumption, allowing the cost of water to be billed to individual apartment dwellers. The program is scheduled to begin in 2005–2006.

New Construction Ordinance

This program will establish regulations to minimize the quantity of water needed to serve new residential development in the City's water service area and will supplement existing plumbing code requirements. The ordinance could require new residential construction to include a water-efficient clothes washer and water-efficient irrigation equipment and plant materials. Meters for individual dwelling units would be required in new multifamily construction, where feasible. This program is scheduled to begin in 2005 or 2006.

Nonresidential Programs

Commercial ULFT Rebates

The City offers a $75 to $150 rebate for the early retirement of nonconserving toilets and urinals, as well as rebates for water-free urinals. This rebate would be offered to commercial, institutional, and industrial customers, including UC Santa Cruz (UCSC). This program began in March 2001.

Commercial, Industrial, and Institutional Water Surveys

The City will provide voluntary water audits by a trained conservation professional to business and industrial customers, including UCSC. The auditor will assess water fixtures, processes, and water use at the site as well as provide recommendations to improve efficiency. Rebates of up to $2,500 will be provided to customers for installing water-saving fixtures and appliances. This program is scheduled to begin in late 2005.

Large Landscape Water Use Review

Under this program, professional landscape auditors will perform site reviews of large landscape customers in the commercial, residential, and golf irrigation customer classes. After basic improvements recommended by the review have been made, an auditor will perform a detailed audit. The auditor will provide site-specific watering schedules, recommendations for irrigation equipment retrofits that would further improve efficiency, and information about irrigation equipment rebates. This program is scheduled to begin in 2006.

Parks Water Use Review

This water use review is similar to the large landscape review, but will be offered to the city and county park districts, which employ older irrigation systems. This program is scheduled to begin in 2006.

Large Landscape Budget-Based Rates

This program will implement budget-based rates for large landscape customers served by dedicated irrigation meters (i.e., parks, golf courses, businesses, and residences). A water budget will be calculated for each account. The program is scheduled to begin in 2006.

In addition to the programs already identified, the City is committed to implementation of 14 water conservation best management practices that are identified in the *Memorandum of Understanding Regarding Urban Water Conservation in California*. Many of these programs are already included in the *Water Conservation Plan*. In addition, state law requires the City to review and update its *Urban Water Management Plan* every five years, during which any new initiatives in the field of water conservation are considered. The City will continue to consider new ideas as they arise and to encourage public involvement in this issue.

4.1.3 Curtailment

In the process of developing the IWP, the City made a fundamental recommendation to not meet full demand in drought years when surface water supplies fall short. The IWP instead calls for supplying 85 percent of normal demand in critical drought years like the 1976-77 event and for a corresponding reduction in peak season water use of 15 percent that would be achieved through temporary watering restrictions and or rationing.

The 15 percent level of cutback was selected as the best compromise that met the overall goal of reducing drought shortages, considering the tradeoffs between multiple objectives to minimize costs, to reduce environmental impacts, and to protect public health and welfare by ensuring sufficient water for basic domestic and business purposes. The curtailment component assumes that customers can and will tolerate a 15 percent overall reduction in water use on a short term basis without undue hardship or substantial economic impact. The greatest impact of curtailment would be on residential and commercial landscaping that would suffer as a result of cutbacks in irrigation during the dry season.

Acceptance of less than full supply in drought years means the capacity of the recommended desalination facility is approximately half the size it would otherwise have to be if the City opted to meet full demand in all years. The recommended plan features a 2.5 mgd desalination facility with two future capacity increments of 1.0 mgd each, eventually totaling 4.5 mgd. To meet full demand in all years would require initially building a 5.0 mgd facility and expanding it to 8.0 mgd by the end of the planning period.

The conservation and curtailment components are closely related in that they both involve reducing water demand to resolve the City’s drought deficiency as opposed to increasing supplies. There are important distinctions, however, that set them apart:

1. Curtailment is a short-term reduction in water use that is taken in response to extraordinary circumstances and involves some level of sacrifice by the customer for a fixed amount of time. The period when customers would be required to cut back usage normally extends for the duration of the dry season, from late spring though summer and into fall. The conservation component, in contrast, emphasizes measures that people can take at any time to reduce average daily use without sacrificing quality of life.

2. Curtailment relies largely on behavioral modifications (e.g. cutting back on the frequency of actions like flushing and watering the garden). The conservation component features technological improvements such as toilet replacement that increase efficiency in use without relying on conscious changes in consumer behavior to achieve water savings.

3. Curtailment focuses primarily on the reduction of outdoor uses of water, including landscape irrigation and exterior washing, to preserve available supplies for essential domestic, sanitary, and fire protection purposes, and for business activity. The conservation component is aimed primarily at reducing interior uses of water.

The unserved demand anticipated in the curtailment component of the IWP would total about 500 million gallons in a severe drought year. This temporary reduction in use would be in addition to the nearly 300 million gallons per year in ongoing water savings gained by improvements in efficiency anticipated from conservation programs by the year 2010.

The curtailment program would be implemented upon a declaration by City Council of a water shortage emergency and adoption of the city's drought emergency ordinance. The last time this ordinance was invoked was in 1992. Because of changes in customer water use characteristics, in community make-up, and in water rates over the intervening time, Water Department staff is undertaking a review and update of the drought emergency ordinance, which is expected to be completed in 2005. Even though the IWP contemplates a worst case water shortage of 15 percent, State law requires water agencies to include in their plans the actions to be undertaken in response to water shortages of as much as 50 percent.

The City's existing drought emergency ordinance is designed using a phased approach that includes four stages ranging from a minimal to a severe water shortage. The corresponding actions required in each stage vary from voluntary use restrictions to mandatory water rationing. In all stages, the ordinance emphasizes the critical importance of reducing outdoor usage. In the early stages, all irrigation is strictly limited to certain times of day or days of the week. In the more critical stages, some types of irrigation are banned altogether.

The available water supply in a drought is allocated among the various classes of customer depending on their water use characteristics and priority of use. The highest priority is given to health and safety needs. All residential interior and nonresidential sanitary uses are assumed to fall under this priority. The second priority use is that related to commercial activity, which includes non-sanitary uses in the business class, industrial and municipal classes of service. The lowest priority is outdoor usage in the single family residential, multi-family residential and irrigation customer classes.

Under the City's allocation scheme, end uses related to health and safety are cut back the least in a water shortage, while irrigation is curtailed the most. As a result, the burden of cutbacks falls hardest on residential customers and dedicated irrigation accounts. While business use takes a lower priority than health and safety uses, the ordinance recognizes the critical importance of business activities to the city's economic well being and to the well being of its citizens and attempts to shield these customers from the full brunt of a water shortage.

Assuming a 15 percent system wide shortage, the percent cutbacks that would be required for each major class of customer in the service area would be as shown in Table 4-2.

Table 4-2
Peak Season Cutback

CUSTOMER CLASS	APRIL-OCTOBER CUTBACK (PERCENT)
Single Family Residential	20
Multi-Family Residential	15
Business	10
Industry	10
University of California	15
Municipal	40
Irrigation	40

Based on the city's experience in past droughts, it is likely that the required cutbacks could be accomplished through voluntary and mandatory water restrictions. The ability of customers to make such cutbacks, however, will be more difficult or costly over time because of increased efficiency in overall water use. This effect, called "demand hardening" occurs because the opportunities available to reduce interior water use are substantially reduced and in some cases exhausted as conservation measures are implemented. If the customer base is unable to achieve the reduction goal with restrictions alone, water rationing would become necessary.

It is assumed that curtailment component would be invoked whenever water supply conditions make it necessary for the City to activate the desalination plant. Thus, the operation of the desalination plant would occur simultaneously with the implementation of a curtailment program, the idea being that any time drinking water is so scarce that it becomes necessary to spend extra money to pay to bring in an expensive additional source of supply, the City should be actively cautioning the public to be judicious in its use of water, and that reasonable watering restrictions consistent with the severity of the drought should be imposed.

4.1.4 Water Supply: Desalination

The IWP advances desalination for further analysis as the water supply option. The project concept is to retrofit an abandoned wastewater outfall with an intake structure and convey water to a location on the west side of Santa Cruz, desalt the water, convey the concentrate to the wastewater treatment plant for blending with the advanced secondary treated wastewater effluent, and convey the permeate to the existing Bay Street Reservoir. The desalination facility would consist of an initial 2.5-mgd desalination plant that could be expanded in increments of 1-mgd to a total capacity of 4.5 mgd and would include conveyance facilities, and associated appurtenances. The relevant components are discussed in the order of the desalination process, as water is taken from the ocean, treated at the desalination plant, and distributed. Specifically, these facilities are the raw water intake system, raw water conveyance facilities, desalination plant, treated water distribution pipeline, and the concentrate discharge system. The Alternative D-2 conveyance facilities is also described.

Raw Water Intake and Appurtenances

<u>Intake Structure</u>

The City would convert the abandoned, 36-inch wastewater outfall to an intake structure to maximize use of existing infrastructure, reduce additional construction and associated environmental effects, and reduce cost. The 36-inch outfall extends from a junction structure at the beach, adjacent to Sunset Avenue, and continues approximately 2,300 feet south into the Pacific Ocean, reaching a final depth of approximately 40 feet below mean sea level (msl). Conversion of the outfall system to an intake system would require installation of a new, 24- to 27-inch lining within the existing 36-inch pipe, and installation of screens and baffles at the end of the outfall. The screens and baffles would have a mesh size of approximately 0.100 inch and are intended to reduce the potential for impingement and entrainment of marine organisms into the desalination facilities. The intake flow would have a maximum through-screen velocity of approximately 0.50 feet per second. The intake would have an air scour system to remove debris caught in or on the intake screen.

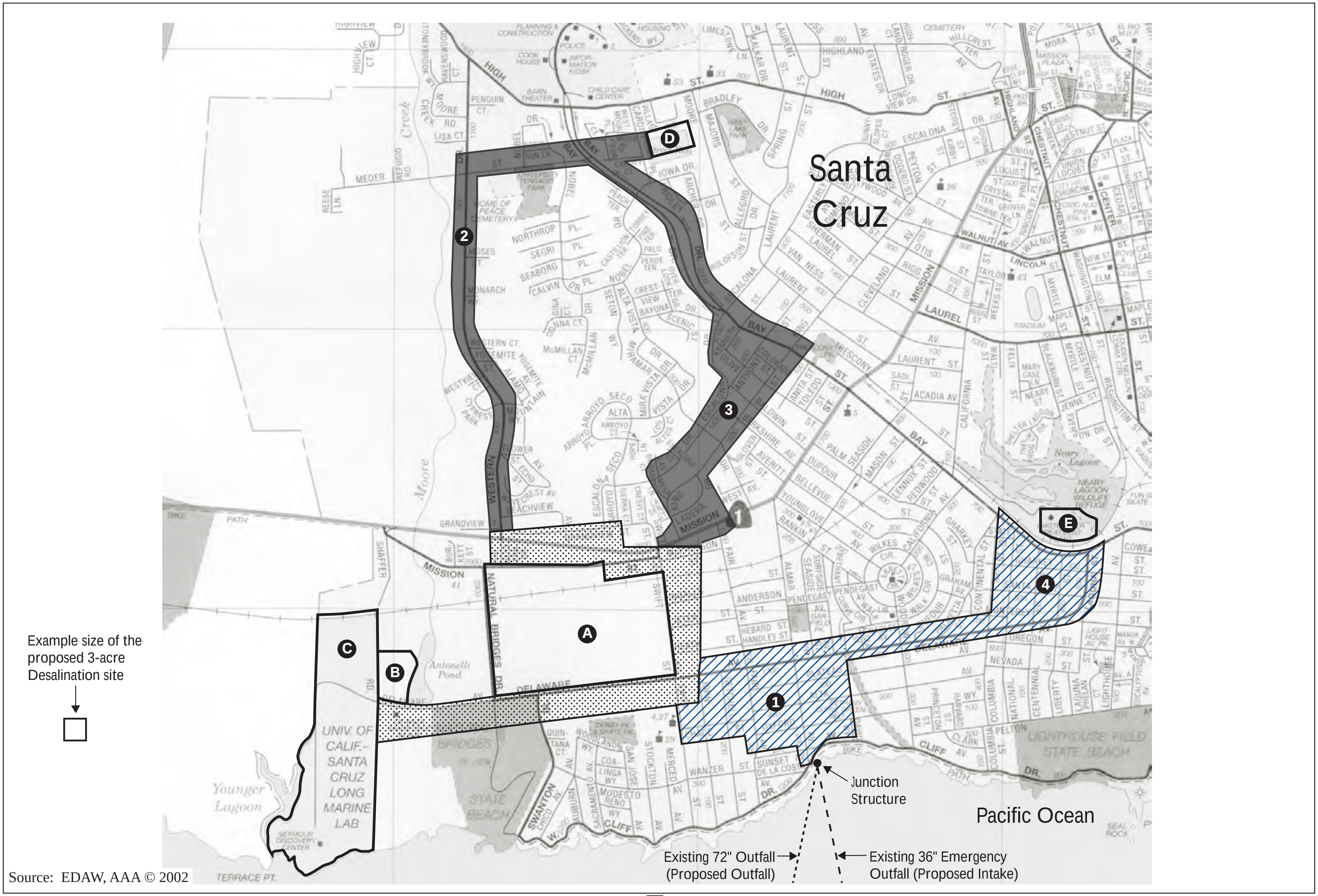
The existing 36-inch pipeline, although abandoned, was used in 1998 as an emergency outfall during an extreme winter storm coupled with a failure of pumps at the WWTP. Conversion of the outfall to an intake structure would eliminate its capacity as an emergency outfall and would therefore require either improvements of existing conveyance facilities or pumping improvements at the WWTP. Details of the intake facility would be developed as engineering design progresses.

<u>Pumping Facility</u>

A booster pump station would be installed at the existing junction structure (located on the beach near the intersection of West Cliff Drive and Sunset Avenue, as shown on Figures 4-1 and 4-2) to pump raw water from the ocean to the desalination plant. Ocean water pumps would be retrofitted into this structure to convey water from the ocean to the treatment facilities. The capacity, motor rating, and noise levels of the pumps would vary depending on the flow and pressure requirements, which would be developed as the design progresses. While the design would be developed to accommodate equipment and components if expansion to 4.5 mgd is needed in the future, only equipment associated with a 2.5-mgd capacity pump would be installed initially. The pump station would be fully enclosed and equipped with residential-rated noise attenuation to ensure compliance with relevant noise standards.

Raw Water Pipeline

The raw (ocean) water pipeline (shown on Figures 4-1 and 4-2 as Corridor 1) would convey pumped seawater to the proposed desalination plant. The raw water pipeline would be up to approximately 24 inches in diameter, sized for approximately 2.4 times the treated water needs to account for the 5 percent of raw water rejected during pretreatment and the 55 percent of water rejected during the desalination process. Streets encompassed within the proposed pipeline corridors are listed in Table 4-3. The raw water intake pipeline could be located on any of the streets identified, but would be



Source: EDAW, AAA © 2002

0 500 1000 2000 Feet

N

Proposed Desalination Areas
- A Industrial Park Area
- B Shaffer Road/Antonelli's Pond Area
- C Terrace Point Area

Existing Facilities
- D Bay Street Reservoir
- E Wastewater Treatment Plant
- 1 – 4 Proposed Pipeline Corridors

- Treated Water Distribution Pipeline Corridors
- Raw Water/Concentrate Discharge Pipeline Corridor
- Combined Distribution/Intake/ Discharge Pipeline Corridor

FIGURE 4-1
Proposed Desalination Areas and Pipeline Corridors

Source: Carollo Engineers 2002; EDAW 2003.

Proposed Desalination Areas
Ⓐ Industrial Park Area
Ⓑ Shaffer Road/Antonelli's Pond Area
Ⓒ Terrace Point Area

① – ④ Proposed Pipeline Corridors

FIGURE 4-2
Proposed Desalination Areas and Pipeline Routes

confined within the public right-of-way. Depending on the location of the desalination site and the pipeline route selected, the length of the pipelines could be up to 15,000 linear feet. Generally, the corridor traverses industrial and residential uses, with intermittent public and park uses in the vicinity.

Table 4-3
Streets Encompassed within the
Raw Water Pipeline Corridors

CORRIDOR 1	
Delaware Street	Sunset Avenue
Swift Street	John Street
Chace Street	Getchell Street
Plateau Avenue	Fair Street
Alta Avenue	Almar Avenue
Oxford Way	West Cliff Drive

Source: EDAW 2003

Desalination Plant

Alternative Area Locations

Figures 4-1 and 4-2 show three alternative locations where a desalination plant of up to three acres could be located. These locations are noted by name and as Areas A, B, or C. The desalination plant is estimated to require approximately three acres, depending on the layout of the components within the facility. An example of the three-acre plant size relative to the proposed desalination areas is shown on Figure 4-1. The areas were selected based on proximity to intake and concentrate disposal facilities, distribution system infrastructure, and power supply; adequate space requirements; and consistency with surrounding land uses. The desalination plant footprint would be configured to fit the selected parcel. The alternative areas considered for desalination plant development are discussed below:

- Industrial Park Area (Area A). The Industrial Park Area is bounded by Mission Street and the Southern Pacific Railroad tracks to the north, Natural Bridges Drive to the west, Swift Road to the east, and Delaware Avenue to the south. The privately owned parcel consists of undeveloped areas and partially developed areas for manufacturing uses (Lipton Plant and Wrigley Plant). The majority of the unoccupied section has been disked and graded, and the Arroyo Seco Canyon Creek[1], which previously passed through the middle of the industrial park, was realigned west of its original location in 2001. Areas considered for development of the desalination plant would either be on undeveloped parcels or within the footprint of existing buildings on developed parcels. The area is surrounded by industrial uses.

- Shaffer Road/Antonelli's Pond Area (Area B). The Shaffer Road/Antonelli's Pond Area (identified as the Swenson Property in the *City of Santa Cruz General Plan*) is located between Shaffer Road and Antonelli's Pond. Antonelli's Pond is an artificial impoundment along lower Moore Creek. Delaware Avenue and the Homeless Garden Project bound the

[1] The realigned Arroyo Seco Canyon Creek is also known as Meder Creek or the Lipton Ditch.

property to the south and north, respectively. A recreational trail traverses the west side of the pond. The approximately 11-acre area is undeveloped and is surrounded by other open space uses and residential uses to the south.

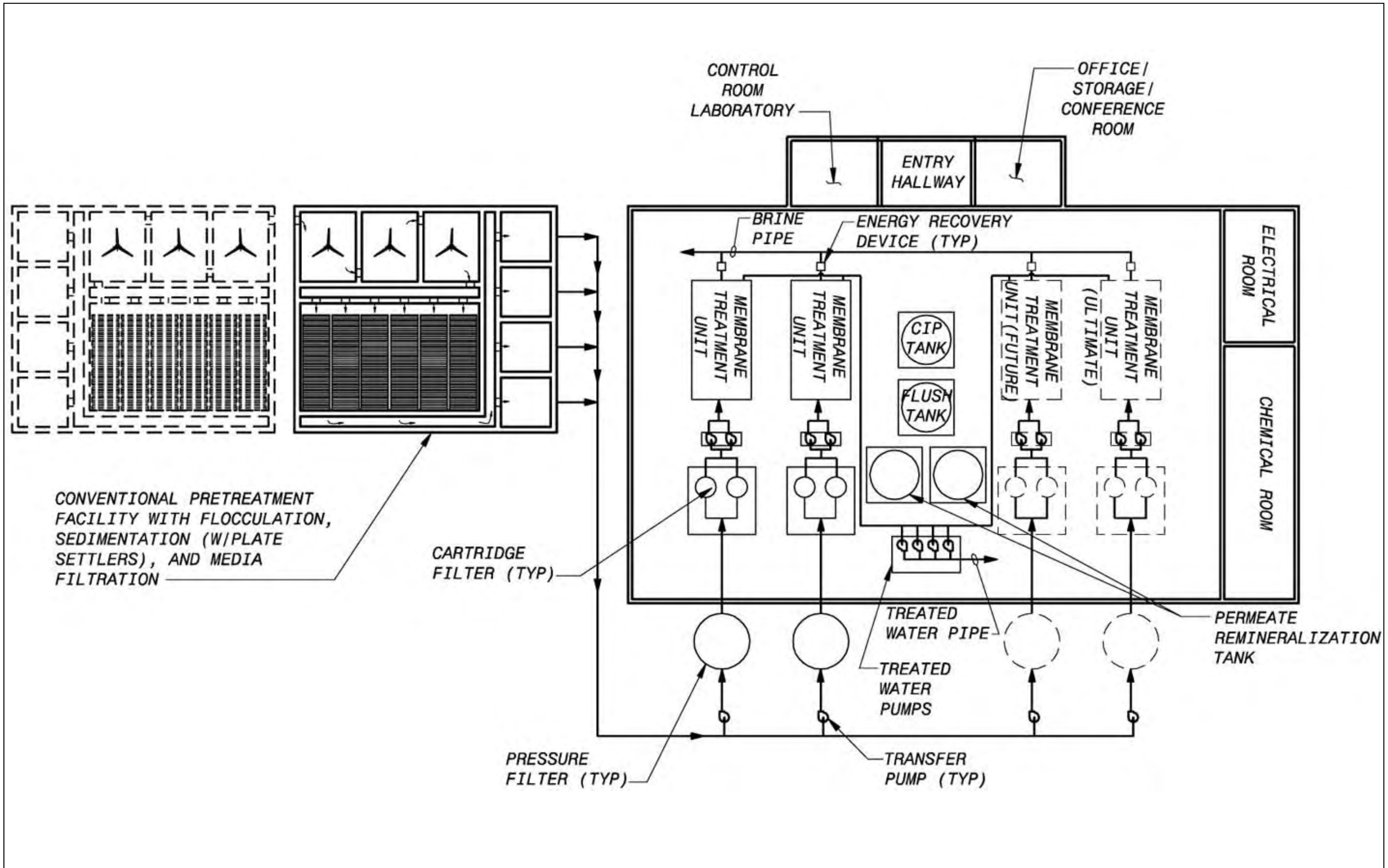
- Terrace Point Area (Area C). The Terrace Point Area encompasses the approximately 60-acre Terrace Point property, the approximately 16-acre Long Marine Laboratory site, and the 29-acre Younger Lagoon. UCSC owns and manages laboratory and research facilities in the western and southern portions of the site. Development of the Long Marine Laboratory is guided by the *Long Marine Laboratory Master Plan*. UCSC is developing a *Coastal Long Range Development Plan* that would guide development for the entire 70-plus acre area and allow UCSC to make land use decisions regarding project development within its property. The Pacific Ocean, residential uses, and the railroad corridor are located to the south, east, and north, respectively. The plant would be located in coordination with UCSC as part of the Coastal Long Range Development Plan development.

Plant Components and Process

A conceptual layout of the desalination facility is provided on Figure 4-3. The final sizing, layout, and dimensions would depend on the actual parcel selected and the siting constraints associated with that parcel. The facilities would be designed to integrate with surrounding uses, to the maximum extent feasible, and could include lighting, fencing, etc. to provide security. The facility would be painted to increase its visual integration with surrounding uses as well as to reduce light and glare. The details of the components would be developed as the design progresses, but would consist of the process components (described below) as well as equipment typically associated with municipal water treatment and conveyance facilities (i.e., chemical storage, administration facilities, vehicle parking and loading areas, electrical room, etc.).

As indicated on Figure 4-3, a building would accommodate the reverse osmosis (RO) membrane components and appurtenant equipment. The building would be sized to accommodate the 4.5-mgd flow capacity, but only components and equipment associated with the 2.5-mgd phase would be installed initially. Additional project-level environmental review would be required for expansion of the proposed facility to 4.5 mgd. Pretreatment facilities and some storage tanks would be located on the site, outside of the building.

The desalination plant would consist of pretreatment, treatment (desalination), pumping, and storage facilities. The specific components would vary depending on the type of pretreatment and treatment processes selected. Pretreatment facilities would likely consist of membrane treatment technologies or conventional water treatment technologies, including granular media filtration. Desalination facilities would likely consist of RO membrane technologies. The City would select the various components depending on a variety of criteria, such as pilot testing, reliability, ability to meet regulatory requirements, cost, and water quality. Figure 4-4 shows a schematic of the flow through a typical desalination plant. Components of the desalination plant are described in further detail below:



Source: Black & Veatch 2003.

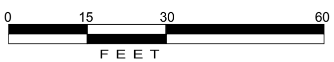
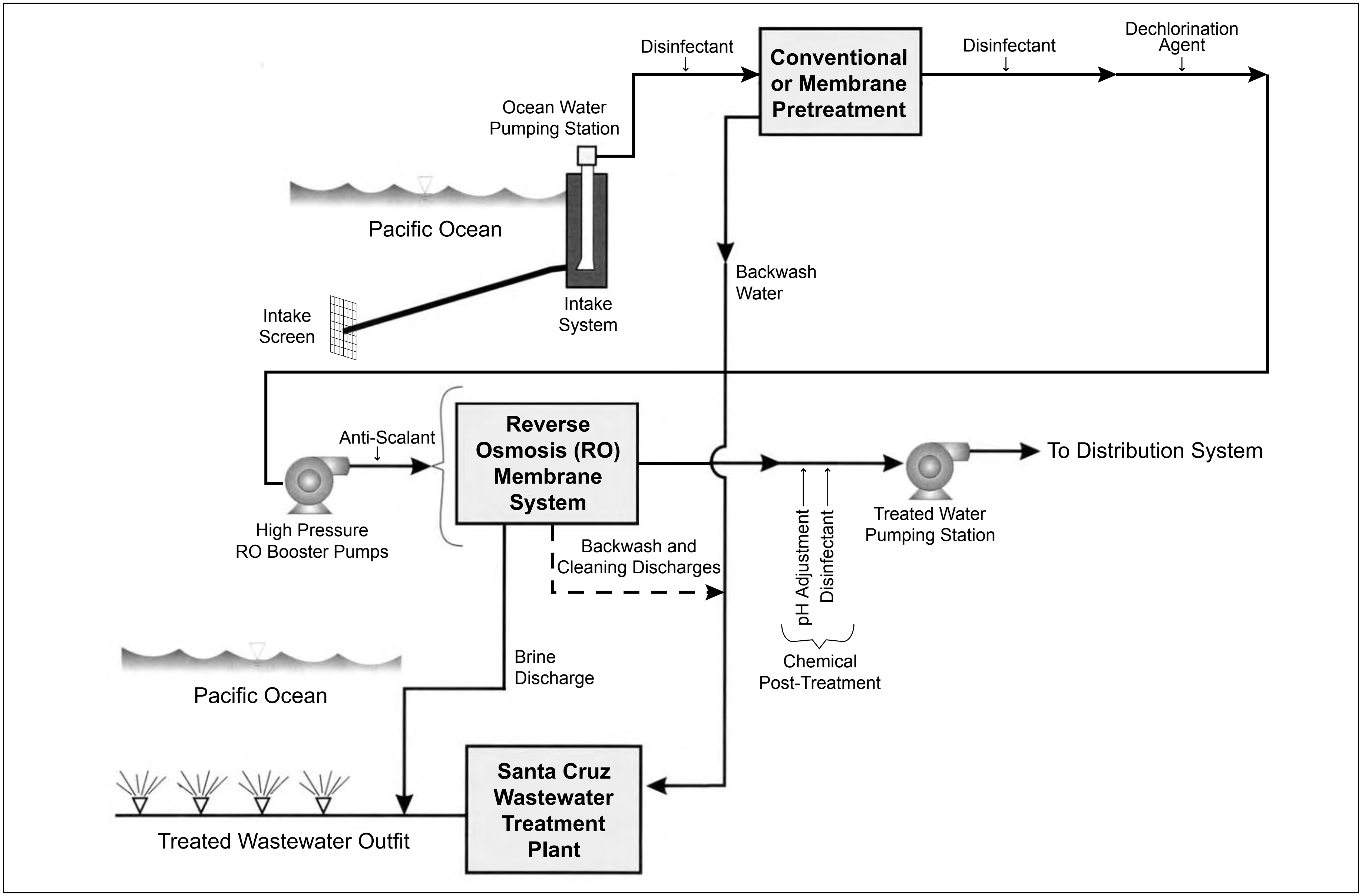


FIGURE 4-3

Desalination Plant Conceptual Layout



Source: Carollo Engineers 2002; EDAW 2003.

FIGURE 4-4

Conventional Desalination System Flow Schematic

- **Conventional Pretreatment:** Prior to being desalinated, the raw water would undergo a pretreatment process to remove constituents that could affect the operation of other downstream treatment mechanisms, such as the RO membranes. The intent of the pretreatment process is to remove suspended particulates in the water and reduce dissolved constituents. A variety of pretreatment systems and technologies are available. The preferred process would be determined as the design of the facility progresses. For the purposes of this document, a conventional pretreatment process has been assumed. This process consists primarily of four steps: coagulation, flocculation, sedimentation, and filtration. Chemicals, including coagulants, would be used in the pretreatment process to remove suspended particles and to clean the filters. Waste streams containing treatment chemicals would be segregated from other water flows at the plant and would not be discharged directly to the ocean.

- **Preliminary Disinfection:** A preliminary disinfection process may also be required to prevent microbiological growth from occurring within the treatment units and to inactivate pathogenic microrganisms. Microbiological growth can lead to reduced efficiency, affect performance of the plant, and potentially cause water quality problems. The preferred preliminary disinfection process would be determined as the design of the facility progresses. For the purposes of this document, chlorination has been assumed. A dechlorination agent may be added to the water if RO membranes are used, as the membranes are not manufactured to withstand chlorine.

- **RO Membrane Desalination:** Once raw water has been pretreated, the water can be conveyed through the RO membranes to remove salts, dissolved solids, and other constituents. High-pressure, electrically driven feed pumps would convey water from the pretreatment process through the RO membranes. The water not passing through the membranes would contain approximately double the quantity of constituents as the ocean water that would be fed into the membranes. Most of the constituents in this highly saline flow stream are dissolved solids or salts. This flow stream is often referred to as "concentrate." Maintenance of the RO membranes would require periodic cleaning using chemical solutions. In addition, storage of the RO membranes would require chemical disinfection and use of a preservation solution. These cleaning and storage solutions would be removed from the membranes, and the associated flow would be segregated from other process flows at the facility and conveyed to the WWTP.

- **Post-treatment:** Post-treatment of the desalinated water is required to control the corrosiveness of the water and provide adequate disinfection prior to distribution. The preferred post-treatment and disinfection methods would be determined as the design of the facility progresses. The selected disinfection methods would likely be consistent with the City's current practices (i.e., chlorine disinfection), to meet state and federal drinking water guidelines. Depending on the disinfection method utilized, a storage reservoir or clearwell could also be required to provide the required contact time between the disinfectant and the treated water. Corrosivity would be addressed by adding chemicals that increase the pH of the water.

- **Pumping Facilities:** Once treated, the water would be conveyed into the City's water distribution system through pumps located at the desalination plant, downstream of the post-treatment facilities. The preferred location for discharge of the treated water would be determined as the design of the facility progresses, but the current approach is to convey the treated water to the Bay Street Reservoir for subsequent storage and distribution. The number, size, and capacity of the pumps for both facilities would vary depending on the flow and pressure requirements. Additional space would be available to accommodate equipment and components if expansion to 4.5 mgd is needed in the future, although only sufficient equipment associated with a 2.5-mgd capacity pump would be installed initially. The pump station would be fully enclosed and equipped with residential-rated noise attenuation to ensure compliance with relevant noise standards.

Chemical Use and Disposal

As previously indicated, operation of the desalination facility, including the pretreatment units, would necessitate the use of processes and chemicals for the treatment and desalination of ocean water. The facility would utilize treatment processes and chemicals that are common in the drinking water industry. Because the chemicals are a function of the treatment processes selected, the necessary chemicals would be identified as the design of the facility progresses. Typical water treatment chemicals are shown in Table 4-4. Regardless of the chemicals used, the final treated water would meet the City's water quality standards as well as those of the U.S. Environmental Protection Agency and the California Department of Health Services.

Table 4-4
Chemicals Typically Used at Desalination Plants

CHEMICAL	PURPOSE	RELEVANT PLANT COMPONENT
Aluminum Sulfate (Alum), Ferric Chloride, Polyaluminum Chloride	Coagulant	Pretreatment
Polymer	Flocculant Aid, Filter Aid	Pretreatment
Acidic/Basic Cleaning Solutions	Membrane Cleaner	RO Membranes
Chlorine	Disinfection/Biological Growth Inhibitor	Pretreatment, Post-treatment
Sodium Bisulfate	Dechlorination	Upstream of RO Membranes
Calcium Hydroxide (Lime), Sodium Hydroxide	Stabilization of Desalinated Water	Post-treatment

Source: Black and Veatch 2003

The frequency of chemical deliveries would depend upon the operational schedule and the volume of desalinated water being produced. The frequency would vary based on several criteria, including the alternative selected, hydrologic conditions, volume of surface water in storage, the amount of water required for distribution, etc. Recommended chemical storage volumes would be based on operational needs. Chemical storage tanks would be neither too small (causing excessive deliveries and minimizing plant operability) nor too large (causing the chemicals to deteriorate and/or lose efficacy). Process flows with excess chemical concentrations would be segregated and disposed of separately to prevent untreated discharge back to the ocean.

Maintenance

Regular maintenance of the equipment and components associated with the facility is required to ensure proper functioning of the plant and to extend its useful life.

Power Supply

Approximately 1 megawatt of power per mgd of treatment plant finished-water production is required for seawater desalination. This is equivalent to approximately 12 kilowatt-hours per 1,000 gallons of water produced, assuming the incorporation of energy recovery devices. This demand would be met by a power substation near the Industrial Park Area. A new power line would be installed and connected to the treatment plant site to accommodate additional energy use. To reduce the total electrical demand of the facility, an energy recovery device would be installed at the plant that uses pressure generated from the desalination process.

Schedule and Priority of Operation

The operation of the desalination facility is summarized in Tables 4-5 and 4-6 and would differ for the two alternatives and for each increment. Under Alternative D-1 (City-only Desalination), the proposed desalination plant would be operated when peak demands are not met by existing supply sources, as would occur during a drought. It is anticipated that operation of the plant at full capacity under a drought scenario has the probability of occurring in one of every six years (or a 15 percent chance every year), typically during dry and critically dry years, and primarily during the peak-demand season. Reduced capacity usage of the plant would also likely occur during dry or critically dry years, and primarily during the peak-demand season.

Under Alternative D-2 (Cooperative Desalination), the plant would likely operate more frequently, based on the needs of SqCWD. Operation of the desalination plant would be defined by the future Operations Agreement between the City and SqCWD.

For each alternative, three discrete increments of desalination capacity are planned. These increments are highly dependent upon the timing of future growth and water demand. The first increment of desalination capacity, 2.5 mgd, is the focus of this EIR, and meets the IWP's near-term goal of reducing near-term drought shortages. For Alternative D-1, the probability of the plant operating full-time at a capacity of 2.5 mgd is once in six years (or a 15 percent chance every year), typically during dry and critically dry years, and primarily during the peak-demand season. For Alternative D-2, the plant would likely operate more frequently at the capacity of 1.25 mgd, based on the needs of SqCWD. Short-term operation at 2.5 mgd could occur during droughts (see Alternative D-1) or when SqCWD requires additional capacity for groundwater basin recovery.

Table 4-5
Desalination Plant Operations
First Increment: 2.5 mgd

CHARACTERISTIC	D-1	D-2
PARTICIPATING AGENCY	City of Santa Cruz	City of Santa Cruz SqCWD
PURPOSE	Drought Protection	Drought protection for City and supplemental supply for SqCWD
PRIORITY OF OPERATION		City of Santa Cruz, as needed SqCWD, when not needed by City, or when surplus capacity exists
TYPE OF OPERATION	Intermittent	Variable, as City operation would be a function of drought SqCWD operation would be a function of supplemental supply requirements for the groundwater basin
TIMES OF OPERATION (YEARS)	1 year in 6 (15 percent of years)*	Potentially 6 years in 6 (100 percent of years) based on "Type of Operation" indicated above
TYPE OF WATER YEAR	Dry, Critically Dry	All year types:(wet, normal, dry, and critically dry)
SEASON OF OPERATION	Summer, fall (May–October)	Potentially year-round
NORMAL PRODUCTION LEVEL	2.5 mgd	1.25 mgd when SqCWD operates 2.5 mgd when City operates
POTENTIAL OPERATING RANGE	Up to 2.5 mgd	Up to 2.5 mgd when jointly operated by City and SqCWD Use of desalination water by SqCWD to restore groundwater basin

* *There is a 15 percent chance in any one year that the desalination plant would be operated.*

Table 4-6
Desalination Plant Operations
Subsequent Increments: 3.5 mgd in 2015; 4.5 mgd in 2025

CHARACTERISTIC	D-1	D-2
PARTICIPATING AGENCY	City of Santa Cruz	City of Santa Cruz SqCWD
PURPOSE	Drought Protection	Drought protection and supplemental supply for City and long-term supplemental supply for SqCWD
PRIORITY OF OPERATION		City of Santa Cruz, as needed SqCWD, when not needed by City, or when surplus capacity exists
TYPE OF OPERATION	Intermittent	Variable, as City operation would be a function of drought, and SqCWD operation would be a function of supplemental supply requirements for the groundwater basin
TIMES OF OPERATION (YEARS)	1 year in 6 (15 percent of years)*	Potentially 6 years in 6 (100 percent of years) based on “Type of Operation” indicated above
TYPE OF WATER YEAR	Dry, Critically Dry	All year types: (wet, normal, dry, and critically dry)
SEASON OF OPERATION	Spring, summer, and fall (March–October)	Potentially year-round
NORMAL PRODUCTION LEVEL	3.5 mgd in 2015 4.5 mgd in 2025	1.25 mgd when SqCWD operates 3.5 to 4.5 mgd when City operates
POTENTIAL OPERATING RANGE	Up to 1.25 mgd could be needed on a regular basis in later years as a supplemental water supply for City	Up to 4.5 mgd when jointly operated by City and SqCWD Use of desalination water by SqCWD to restore groundwater basin

* *There is a 15 percent chance in any one year that the desalination plant would be operated.*

Based upon current water demand projections, additional increments of desalination capacity are 1.0 by 2015 and 1.0 mgd by 2025. These increments meet the IWP's long-term goal of providing a reliable supply and ensuring the protection of public health and safety. The frequency of operation for each of these increments is similar to the 2.5-mgd increment, but the duration of operation at the higher capacity would be longer.

- For Alternative D-1, full capacity operation of the plant at 3.5 mgd in 2015 or 4.5 mgd in 2025, under a drought scenario, has the probability of occurring once in six years (or a 15 percent chance every year), typically during dry and critically dry years, from March through October (eight months).

- For Alternative D-2, SqCWD would not require additional supply beyond that identified for the first increment. The plant would normally operate at 1.25 mgd.

- In later years, the City could need up to 1.25 mgd on a regular basis as a supplemental water supply.

Subsequent environmental review would be required to evaluate these incremental expansions. At that time, the City would reevaluate the water demand projections against the base population and employment projections provided in the then-current General Plan and regional plans to determine what level of expansion would be necessary. Future incremental increases in the desalination capacity would be based on the timing of growth and demand.

Treated Water Distribution Pipeline (Corridors 2 and 3)

The treated water distribution pipeline would convey treated (product) water from the desalination plant to the Bay Street Reservoir. The distribution pipeline would be up to approximately 20 inches in diameter and up to 15,000 linear feet, depending on the desalination site and specific pipeline alignments selected. Two corridors provide alternative options for pipeline routing, as shown on Figures 4-1 and 4-2. Streets encompassed within the proposed pipeline corridors are shown in Table 4-7. Both corridors would be located primarily along public rights-of-way, through residential, commercial, and industrial uses. Surrounding uses also include open space areas.

Table 4-7
Streets Encompassed within the Treated Water Distribution Pipeline Corridors

CORRIDOR 2	CORRIDOR 3	
Cardiff Place	Iowa Drive	Olive Street
Cardiff Court	Cardiff Place	King Street
Bay Street	Bay Drive	Mesa Lane
Meder Street	Bay Street	Mission Street
Western Drive	Escalona Drive	Swift Street
Mission Street	Anthony Street	Delaware Avenue
	Kenneth Street	

Source: EDAW 2003

Concentrate Discharge Pipeline

The concentrate discharge pipeline would connect to either the existing 72-inch City wastewater outfall pipeline at the WWTP or at the existing outfall junction structure located on the beach near the intersection of West Cliff Drive and Sunset Avenue. The concentrate discharge pipeline would be up to approximately 24 inches in diameter. The proposed concentrate pipeline corridors are shown on Figures 4-1 and 4-2. Streets encompassed within the proposed pipeline corridors are listed in Table 4-8. The concentrate discharge pipeline would be located within public street right-of-ways, parallel with the raw water pipeline to the extent feasible. Where the concentrate discharge would be routed to the WWTP, it would follow Corridor 4. Depending on the site and pipeline alignments selected, the length of the pipelines would be up to 15,000 linear feet. Generally, the corridors traverse industrial and residential uses, with intermittent public and park uses in the vicinity.

Table 4-8
Streets Encompassed within Concentrate Discharge Pipeline Corridors

CORRIDOR 1		CORRIDOR 4[1]	
Delaware Street	Sunset Avenue	Delaware Avenue	Laguna Street
Swift Street	John Street	Columbia Street	Monterey Street
Chace Street	Getchell Street	National Street	Santa Cruz Street
Plateau Avenue	Fair Street	Centennial Street	Gharkey Street
Alta Avenue	Almar Avenue	Liberty Street	Bay Street
Oxford Way			
West Cliff Drive			

[1] *The streets associated with Corridor 4 would be applicable only if the concentrate is disposed via the WWTP.*

Source: EDAW 2003

Concentrate Discharge Modifications

The City would modify its wastewater outfall to maximize use of existing infrastructure and to reduce additional construction, associated environmental effects, and cost. To facilitate disposal, concentrate (the high-salinity by-product of the RO process) would be blended with the treated WWTP effluent prior to discharge. The concentrate would be diluted by the low-salinity treated effluent and discharged to the Pacific Ocean through the existing 72-inch wastewater outfall.[2] The concentrate would be blended with the treated effluent in one of two junction structures, one at the WWTP site and one near the beach. The preferred blending location and methods would be determined as the design of the facility progresses. The blended discharge would comply with the requirements of the revised National Pollutant Discharge Elimination System (NPDES) permit for the existing WWTP.[3] An equalization tank could be added to equalize concentrate flows during low-effluent flow periods so that blended water meets the requirements of the current NPDES permit. If

[2] The landward terminus of the existing 72-inch outfall is within the junction structure near the beach at West Cliff Drive, near Sunset Street; the outfall subsequently extends more than two miles on the bottom and terminates one mile offshore, at a depth of approximately 110 feet below msl. Currently, the pipeline discharges, on average, 10 mgd of wastewater into the ocean (Carollo Engineers, 2002).

[3] The City of Santa Cruz Water Department would coordinate with the City's Public Works Department and the Central Coast Regional Water Quality Control Board to amend the WWTP's NPDES permit to accommodate concentrate in the effluent discharge, as needed.

flows and permit requirements cannot be managed under the current permit conditions, then an amended permit, approved by the appropriate regulatory agency(s), would be obtained.

D-2 Conveyance Facilities and Appurtenances (Corridors 5, 6, and 7)

In addition to the facilities described above, pipelines would be required to convey water from the City service area if SqCWD decides to participate in the proposed IWP under Alternative D-2 (Cooperative Desalination). The potential pipeline corridors linking the two water systems are shown on Figures 4-5 and 4-6. Streets encompassed within the corridor are listed in Table 4-9.

The proposed pipelines would have a diameter of up to approximately 20 inches and length of up to 20,000 linear feet, depending on the route selected. A proposed booster pump station would be constructed adjacent to the pipeline. A detailed layout and design of the pump station would be further developed as the program progresses and would be developed to ensure compliance with relevant noise standards. Additional improvements to SqCWD's potable water distribution system could also be required.

Table 4-9
Streets Encompassed within the Alternative D-2 Pipeline Corridors

CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
Soquel Avenue Soquel Drive	Soquel Avenue Capitola Avenue	Ocean Street East Cliff Drive Murray Street Railroad Right-of-Way 41st Avenue

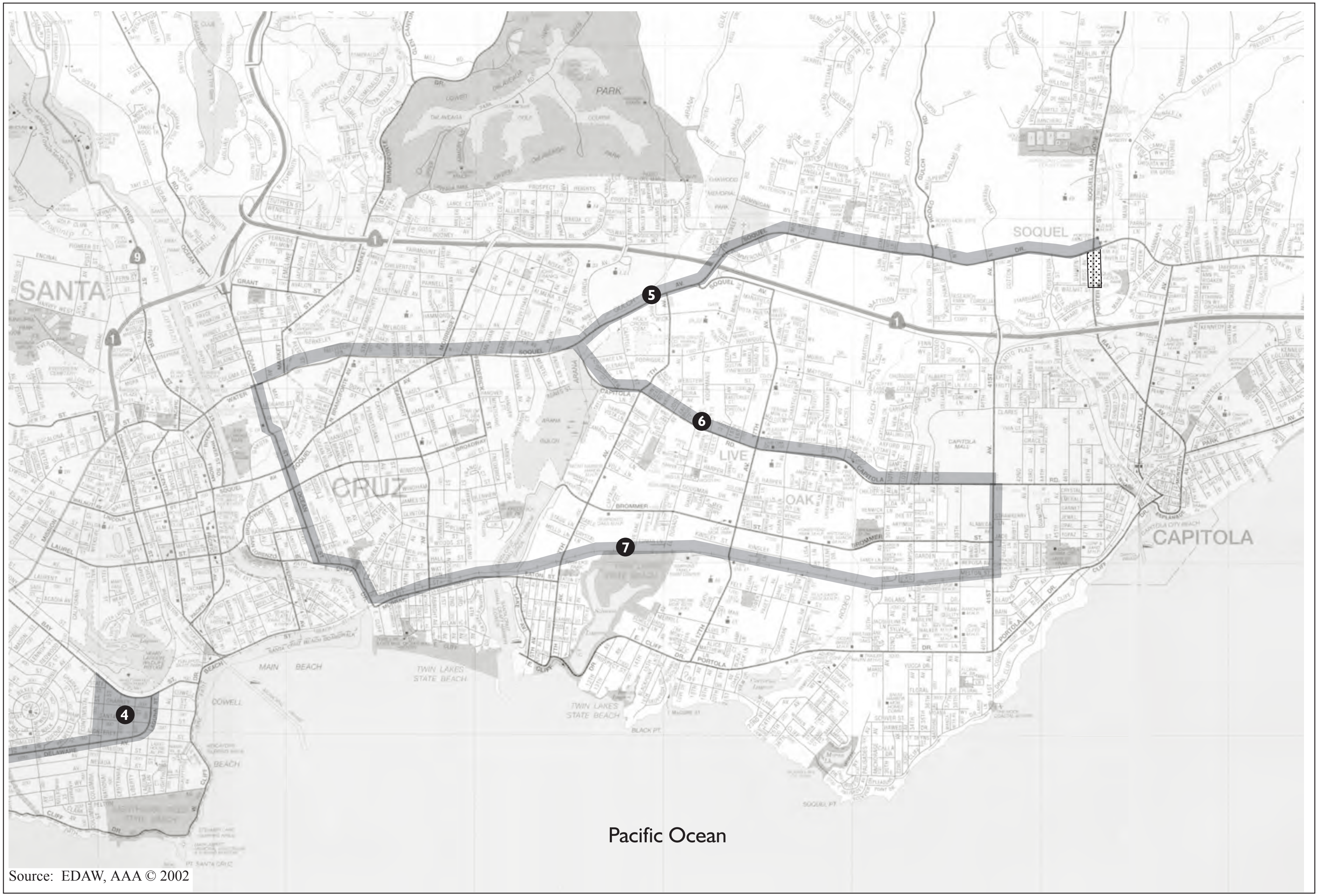
Source: EDAW 2003

4.2 CONSTRUCTION

4.2.1 Raw Water Intake and Appurtenances

The City would accommodate the raw water intake within an abandoned 36-inch wastewater outfall. Modification to the outfall would involve installing a lining along 2,000 linear feet and placing screens and baffles at the end of the pipeline. Limited excavation of the seabed would likely be required to access the end of the outfall and facilitate improvements. Construction equipment and materials would be staged and may be stored on a barge floating in the ocean near the outfall. The equipment likely to be required for construction would be developed as engineering design progresses.

Modifications to the junction box to accommodate an additional pump station would require the closure of the stairway leading to the beach. The City would ensure recreational access to the area is maintained by providing alternative access east of the site. The construction area would be limited, to the extent feasible, to minimize beach closures.



Source: EDAW, AAA © 2002

0 500 1000 2000 Feet

❹–❼ Proposed Pipeline Corridors

Possible Upgrades in Soquel System

FIGURE 4-5
Proposed Alternative D-2 Pipeline Corridors

Source: EDAW 2003.

School Site

4 – 7 Please refer to Project Description tables for pipeline route

0 875 1750 3500
FEET

N

FIGURE 4-6
Proposed Alternative D-2 Pipeline Corridors

4.2.2 Conveyance Facilities

Cut-and-Cover Technique

The proposed pipelines (raw water, treated water, concentrate discharge, and D-2 pipelines) would primarily be located within public road right-of-ways. The proposed pipelines would be installed primarily using the conventional "cut-and-cover" technique, which involves sawcutting the pavement, excavating a trench, removing the soils, installing the pipeline, backfilling the trench, and repaving. A minimum construction easement width of 20 feet is typically needed to accommodate pipe storage and to allow trucks and equipment access along the trench. In some areas where multiple pipelines may be installed in parallel (e.g., Corridor 3), a wider trench and construction easement could be required, depending on the placement of the pipelines relative to one another (vertically or horizontally). Other construction activities, such as the installation of pipeline connections, buried vaults, etc., could also require wider excavations. Excavation activities would require closure of at least one lane of the roadway. Soil removed from the trenches would either be stockpiled and reused, to the extent feasible, or loaded directly into dump trucks and hauled away for disposal per requirements of the City of Santa Cruz and Santa Cruz County. If existing soil is not adequate for backfilling, then new material would be imported for backfilling.

Typical construction equipment associated with installation of pipelines would include: pavement saws, jack hammers, excavators, backhoes, 10-wheel dump trucks, front-end loaders, forklifts, flatbed delivery trucks, paving equipment (asphalt and/or concrete trucks, rollers), water trucks, and vibratory compactors. Where feasible, staging areas would be accommodated adjacent to or in vicinity of the pipeline corridors.

Trenchless Techniques

Trenchless construction could be required for crossings where cut-and-cover methods are not feasible or acceptable, including busy intersections (e.g., Highway 1), railroad tracks, congested utilities, or sensitive creeks. There are several types of trenchless construction methods, including directional drilling, microtunnelling and bore-and-jack technique.

Directional drilling requires the use of a surface-launched drilling rig to steer a drill in a shallow arc under a sensitive crossing. To complete the bore, two pits are excavated on either side of the crossing. A fluid-filled pilot bore is drilled from the pilot hole to the receiving hole. The hole is enlarged by a back reamer or hole opener. In addition to receiving the drill head at the receiving hole, the pipeline is pulled from the enlarged hole back to the entry pit, thereby completing the installation process. Entry and receiving holes range in size depending on the length of the crossing, but typically have dimensions of approximately 50 by 50 feet.

Microtunnelling and bore-and-jack would require the use of a horizontal boring machine or auger to drill a hole, and a hydraulic jack to push a casing through the hole under the crossing. As the boring proceeds, a steel casing pipe is jacked into the hole and the pipeline is installed in the casing. This process would require the excavation of pits at opposite ends of the crossing.

The use of trenchless techniques would be determined once the alignments are selected and the issues associated with this option are identified. As with the open-trench method described above, soil removed from pits would either be stockpiled and reused, to the extent feasible, or loaded directly into dump trucks and hauled away for disposal per requirements of the City of Santa Cruz and Santa Cruz County. If existing soil is not adequate for backfilling, then new material would be imported for backfilling.

4.2.3 Desalination Plant

Construction

Construction of the proposed desalination plant would involve site clearing, excavation, foundation and underground construction, construction of aboveground structures, paving, and restoration of the disturbed area (landscaping). If construction occurs within unoccupied buildings, it would be necessary to demolish internal facilities prior to constructing the desalination facilities. Underground structures would include piping and utilities. For deeper excavation, shoring may be used to prevent collapse of excavated pits. Soil removed from the pits would either be stockpiled and reused, to the extent feasible, or loaded directly into dump trucks and hauled away for disposal per requirements of the City of Santa Cruz. If existing soil is not adequate for backfilling, then new material would be imported for backfilling.

Typical construction equipment would include: excavators, backhoes, 10-wheel dump trucks, front-end loaders, forklifts, flatbed delivery trucks, paving equipment (asphalt or concrete trucks, rollers), water trucks, vibratory compactors, and cranes. Staging areas would likely be accommodated within the proposed desalination plant area, as sufficient space is available at this location.

4.2.4 Construction Hours

The hours of construction for each component would vary depending on the location, but would typically occur during weekdays, between 8 a.m. to 6 p.m. Weekend and nighttime construction may occur where necessary or to reduce traffic-flow impacts.

4.2.5 Construction Truck Trips

Construction-related truck trips would be generated from the removal of excavation material, the delivery of equipment and material, and from workers driving to and from the site. Construction-related truck trips would be scattered geographically and throughout the day and would follow designated haul routes identified by the affected jurisdictions.

4.3 IMPLEMENTATION SCHEDULE

The proposed Program would be implemented in phases, as defined in Section 3.2, Program Need and Objectives. The phases are tied to the population projection horizons identified in the *City of Santa Cruz General Plan and Local Coastal Program*. The near-term phase is defined as 2005 to match the current General Plan's horizon, which would not be achieved until 2009. The long-term phase is the period from 2005 through 2020 to synchronize with the planning horizon that would be identified in the updated General Plan. Expansion requirements of the desalination plant to its future increments would be confirmed upon update of the population projections in the General Plan. Following completion of the Program EIR and City Council action, the City would conduct follow-up, project-level environmental analysis for the near-term, 2.5-mgd desalination plant development. At such time, site-specific engineering and design information would be incorporated into the environmental documentation. Construction would occur after completion of the project-level CEQA analysis, design of the near-term facilities, and permit acquisition. Construction of the first phase of the desalination plant and associated facilities would last approximately 18 to 34 months and is anticipated to be complete by 2008 to 2010. The plant would be operated thereafter.

Subsequent environmental review would be required to evaluate the incremental expansion of the 2.5-mgd desalination plant (to 3.5 and 4.5 mgd). At that time, the City would reevaluate the water demand projections against the base population and employment projections provided in the then-current General Plan to determine what level of expansion would be necessary. Future incremental increases in the desalination capacity would be based on the timing of growth and demand.

4.4 ALTERNATIVES EVALUATED

Pursuant to *CEQA Guidelines* Section 15126.6, "An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." A "no project" alternative is required under CEQA. Other reasonable alternatives include desalination strategies at different curtailment levels and capacities. These alternatives to the Program are described below.

4.4.1 No Program Alternative

The "no project" alternative is defined as "What would reasonably be expected to occur in the foreseeable future if the project were not approved" (*CEQA Guidelines* 15126[e][2]. This EIR identifies a No Program Alternative, under which the City would not implement the proposed IWP, which would limit curtailment to 15 percent and augment supply with desalination. Conservation, which is currently being implemented, would continue. The City would continue to obtain its water from the four existing sources. During dry and critically dry periods, the City would curtail water use. Based on studies conducted to date, the amount of water curtailed could be as high as 45 percent if a drought similar to the 1976-77 drought occurs.

4.4.2 No Curtailment Alternative – Curtailment Profile 1 (0 percent)/5 mgd Desalination Plant (expandable to 8 mgd)

This alternative is a variation of Alternatives D-1 and D-2. It would involve the construction of a 5-mgd desalination facility to meet 2005 demands, to maintain a 0 percent level of curtailment during drought years. The plant would have a future capacity of 8 mgd. This strategy would involve construction of desalination components similar to those proposed for Alternatives D-1 and D-2, but the facilities would be larger.

4.4.3 High Curtailment Alternative – Curtailment Profile 3 (25 percent)/2 mgd Desalination Plant (expandable to 4 mgd)

This alternative is a variation of Alternatives D-1 and D-2. It would involve the construction of a 2-mgd desalination facility to meet 2005 demands, to maintain a 25 percent level of curtailment during drought years. The plant would have a future capacity of 4 mgd. This strategy would involve construction of desalination components similar to those proposed for Alternatives D-1 and D-2, but the facilities would be smaller.

4.5 INTENDED USES OF THE EIR AND REQUIRED AGREEMENTS, PERMITS, AND APPROVALS

This EIR is intended to: (1) be used by the Santa Cruz City Council when taking action on the proposed IWP; (2) provide the foundation for tiering CEQA review and documentation on specific future actions associated with development of the proposed Program components, as details of these components are defined; (3) assess the environmental issues that require further evaluation to facilitate permit acquisition from responsible and trustee agencies; and (4) provide the responsible and trustee agencies with the necessary documentation to approve the Program. Table 4-10 identifies the agreements, permits, and approvals that may be needed to implement the Program. The need for some of these permits and agreements would depend on the final locations of the proposed facilities.

Table 4-10
Federal, State, Regional, and Local Permits and Requirements that May Apply to the IWP

AGENCY AND REQUIREMENTS	ACTIVITIES SUBJECT TO REQUIREMENT	RELEVANCE TO PROJECT(S)
FEDERAL		
U.S. Army Corps of Engineers		
Clean Water Act, Section 404 Permit, Rivers and Harbors Act of 1899, Section 10	Filling of wetlands or surface waters	Intake facility; pipelines (creek crossings)
U.S. Fish and Wildlife Service		
Endangered Species Act Section 7 Consultation	Effects on federal listed species and habitat	Desalination plant and associated facilities, concentrate discharge
National Oceanic and Atmospheric Administration		
Commenting Agency to U.S. Army Corps of Engineers Marine Mammal Protection Act, Small Take Authorization for Incidental Harassment Marine Sanctuary Protection	Offshore components with potential to affect marine resources Harassment or unintentional take of marine mammals Water discharge, use of surface resources	Intake facility Construction and operation of intake facility Operation of desalination plant concentrate discharge

Table 4-10
Federal, State, Regional, and Local Permits and Requirements that May Apply to the IWP

AGENCY AND REQUIREMENTS	ACTIVITIES SUBJECT TO REQUIREMENT	RELEVANCE TO PROJECT(S)
FEDERAL		
U.S. Coast Guard		
Consult with U.S. Army Corps of Engineers during Section 10/404 process	Vessels, traffic safety, and navigation hazards potentially associated with intake structure	Intake facility
State Historic Preservation Office		
Section 106 Compliance, National Historic Preservation Act	Construction, operation, and/or abandonment of facilities on land under federal jurisdiction; effects on cultural resources; commenting agency for the 404 process	Desalination plant and associated facilities
Monterey Bay National Marine Sanctuary		
National Marine Sanctuaries Act, Section 922.132	Discharging any material entering the Sanctuary, altering the seabed of the Sanctuary	Concentrate disposal, intake structures
STATE		
California Coastal Commission		
California Coastal Act, Coastal Development Permit	Development in coastal zone, including tidelands, submerged lands, and public trust lands	Intake facilities, pipelines, desalination facilities
California Department of Fish and Game		
Streambed Alteration Agreement Endangered Species Act, Section 2081 Permit	Changes in natural condition of streams, lakes, and rivers. Effects on California listed species and habitats	Pipelines (creek crossings) Construction and operations of any facilities
State Lands Commission [1]		
Possible lease permit for area below mean high-tide line	Facilities in tidal and submerged lands	Intake Facility, modification to existing junction structure
California Department of Transportation		
Encroachment Permit	Activities affecting right-of-way of state highways	Pipelines on or crossing Route 1
California Department of Health Services		
Amended Domestic Water Permit Source Water Assessment and Protection Plan	Domestic Water Permit Amendment	Desalination components

Table 4-10
Federal, State, Regional, and Local Permits and Requirements that May Apply to the IWP

AGENCY AND REQUIREMENTS	ACTIVITIES SUBJECT TO REQUIREMENT	RELEVANCE TO PROJECT(S)
REGIONAL/COUNTY		
Regional Water Quality Control Board, Central Coast Region		
Clean Water Act, Section 401 Water Quality Certification	Activities affecting surface water quality (review of federal permits)	Pipelines (creek crossings)
NPDES Permit/Stormwater Runoff	Construction activities	All proposed facilities
Revision of NPDES for wastewater treatment plant	Discharge of concentrate (combined with wastewater effluent)	Desalination components
The Monterey Bay Unified Air Pollution Control District		
Permit to Construct/Operate	Non-standby diesel engines with a capacity of over 100 horsepower	Backup generators
Santa Cruz County		
Hazardous Materials Permit	Installation of chemical storage facility	Desalination Plant
LOCAL		
The City and Potential Partner		
Interagency Operations Agreement	Joint operations of the desalination plant	Alternative D-2
The City of Santa Cruz		
Local Coastal Program, Development Permit	Any construction activities in the coastal zone	Pipelines, desalination facilities
City of Santa Cruz Public Works		
Encroachment Permit	Activities affecting right-of-way on roadways within the city of Santa Cruz	Pipelines
Santa Cruz County Public Works		
Encroachment Permit	Activities affecting right-of-way on roadways within unincorporated areas of Santa Cruz County	Pipelines for Alternative D-2
City of Capitola Public Works		
Encroachment Permit	Activities affecting right-of-way on roadways within the city of Capitola	Pipelines for Alternative D-2

1 *The State Lands Commission typically consults with the State Historic Preservation Officer regarding potential impacts to cultural resources (e.g., shipwrecks) in state waters.*

REFERENCES

Gary Fiske & Associates. June 2003. *City of Santa Cruz Integrated Water Plan*, Draft Final Report.

Gary Fiske & Associates (and Jennifer J. Stout – Water and Energy Consultant). February 2000. *Water Conservation Plan Final Report*.

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Chapter 5 Environmental Evaluation

INTRODUCTION

This chapter describes the existing conditions and regulatory framework, evaluates the environmental impacts of the proposed Program, and proposes mitigation measures to reduce potential significant impacts.

Conservation

The proposed conservation program consists of limited internal and external improvements for existing water users, issuance of rebates, establishment of ordinances, and water audits. Implementation of the program would not result in a direct or indirect physical change in the environment, and hence no impacts to the environment. As such, the conservation program was not subject to California Environmental Quality Act (CEQA) analysis prior to implementation, and no further analysis is required. Water conservation is beneficial to the environment because it reduces the use of existing water sources. Conservation is particularly important during drought years, when rainfall is unavailable to meet peak demands.

Curtailment and Water Supply (Desalination)

Implementation of the proposed Program would involve physical changes to the environment associated with curtailment and the implementation of the water supply component. The impacts of curtailment are primarily economic and social, for which no environmental analysis is required under CEQA.[1] The physical impacts of curtailment include the loss or reduction in aesthetic value of landscaped plants, which would require evaluation in terms of the potential for changes in the visual quality of the surrounding environment. Physical changes associated with proposed Program implementation would primarily involve the siting and operation of the desalination facility.

As described in Chapter 4, Program Description, the proposed Program consists of two operational alternatives, Alternative D-1 (City-only desalination) and Alternative D-2 (Cooperative Desalination). Under both alternatives, the City would implement conservation and curtailment components and would construct and operate a 2.5-million-gallon–per-day (mgd) desalination facility that would be expanded in increments to 4.5 mgd. The desalination facilities incorporated into both alternatives include:

- Desalination plant (at one of three sites)
- Raw water intake (in the ocean) and pumping facility (at the existing junction structure)
- Raw water pipeline
- Treated water distribution pipeline
- Brine discharge pipeline

[1] *CEQA Guidelines* Section 15064(e) states that "economic and social changes resulting from a project shall not be treated as significant effects on the environment."

Alternative D-2 includes an additional pipeline corridor, pumping facilities, and modifications to existing distribution systems. In addition to an additional pipeline and pump station(s), the two alternatives are distinguished by their operations at specific increments. In the near term, or first increment, the plant would be capable of producing 2.5 mgd of desalinated water. Subsequent increments are associated with expansion of the plant to 3.5 and 4.5 mgd. Under all increments, Alternative D-1 is intended to provide drought reliability to the City. Alternative D-2 is intended to provide a continuous water supply for a regional partner (Soquel Creek Water District, SqCWD), while also providing the same level of drought reliability to the City.

SECTION ORGANIZATION

For each issue area discussed in this section (e.g., Hydrology and Water, Marine Resources), the evaluation is organized in the following manner.

Existing Conditions

In accordance with *CEQA Guidelines* Section 15125(a), an environmental impact report (EIR) includes a "description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published." The Existing Conditions sections present the existing environmental setting of the region and the study area. The study area varies among resource issues, but generally encompasses the local areas affected by proposed Program implementation. Each section is organized by operational alternative (i.e., the first increments of 2.5 mgd and subsequent increments of 3.5 and 4.5 mgd) and by proposed facilities (i.e., desalination plant, conveyance and pumping facilities, etc.). For example, in the Hydrology and Water Quality section, a description of the regional setting is provided, followed by more specific characterization of water resources in the study area of the shared facilities of Alternatives D-1 and D-2, and then the facilities for Alternative D-2 only.

CEQA Guidelines Section 15125(a) specifies that "the environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant." Therefore, the Existing Conditions sections provide a description of the baseline against which impacts are evaluated and mitigation measures are formulated.

Regulatory Framework

Where the proposed Program components are located within the jurisdiction of federal, state, and local regulatory agencies, the City would be subject to the laws, regulations, and policies of those agencies. These regulations provide both the definitions and procedures that guide development to reduce adverse effects on sensitive resources, or offer general guidance on the protection of such resources. The regulatory framework sections describe the relevant rules that may be applicable to the proposed Program for each issue area. These rules may also set the standards (threshold of significance) by which potential effects are evaluated (see discussion below).

Impacts and Mitigation Measures

CEQA Guidelines Section 15064.7 defines “thresholds of significance” as “an identifiable quantitative, qualitative or performance level of a particular environmental effect, noncompliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect will normally be determined to be less than significant.” These levels of significance are outlined at the beginning of each Impacts and Mitigation Measures section and are primarily derived from Appendix G, Environmental Checklist Form, of the *CEQA Guidelines*. The levels are also based on the City’s significance standards and agency/regulatory standards.

In accordance with *CEQA Guidelines* Section 15126.2, “an EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time of the notice of preparation is published.” These physical changes are evaluated against the threshold criteria to determine their level of significance. If changes resulting from the project exceed thresholds of significance, then impacts are considered significant. If impacts are below the significance criteria, they are considered less than significant.

The Impacts and Mitigation Measures section is organized by operational alternative and by component groupings. Where differences in operation would result, the discussion of the alternatives is separated by their operational increments. For example, the shared components of both alternatives are identified under the heading “Alternative D-1 and D-2 (Applicable to the First Increment of both Alternatives)” if they apply to development of the 2.5-mgd facility. If the discussion applies only to Alternative D-2 for the 2.5-mgd facility, then the heading reads “Alternative D-2 (Applicable to the First Increment of this Alternative Only). If discussions are relevant only to the 3.5- or 4.5-mgd expansions, then the heading reads: “Alternative D-1 and D-2 (Applicable to Subsequent Increments),” “Alternative D-1 (Applicable to Subsequent Increments of this Alternative Only),” or “Alternative D-2 (Applicable to Subsequent Increments of this Alternative Only),” depending on the relevance to the specific alternative(s).

The impact analyses are based on the information and assumptions presented in Chapter 4, Program Description. Although site-specific information (i.e., detailed design and engineering information) for the components would be developed for subsequent environmental analysis, changes to the component locations or sizing are not anticipated. If such changes do occur, adequate analysis of these changes would be required in follow-up environmental review to ensure conformance with CEQA requirements. However, to allow for a meaningful assessment of potential impacts, assumptions regarding site-specific details have been made in certain resource areas.

Impacts associated with construction of the desalination facility are evaluated for the first increment (2.5 mgd) unless otherwise specified. Expansion of the desalination facility (3.5 and 4.5 mgd) would require limited construction of additional facilities within the original footprint of the 2.5-mgd plant; additional facilities outside of the plant property are not anticipated at this time. Upon development of specific engineering details, appropriate environmental review would be conducted to evaluate the potential impacts associated with plant expansion. Impacts are provided to the extent they can be evaluated at a program level.

Mitigation measures are intended to reduce potentially significant, adverse effects to less-than-significant levels. Measures that are specific to a particular component are identified as such. In the absence of site-specific design and engineering information that would allow for a project-specific analysis, many of the mitigation measures are primarily performance-level measures. In other words, the measures are formulated to achieve a certain level of protection (e.g., to meet noise standards of the affected jurisdiction), rather than to provide specific actions that must be implemented. Where possible, examples to achieve the performance levels are provided. The level of significance after implementation of mitigation measures is provided to indicate whether additional impacts remain.

Growth inducement and secondary effects of growth, and cumulative impacts are evaluated in Chapters 6 and 7, respectively.

Each environmental evaluation section includes a table that summarizes the potential impacts that could result from implementation of the proposed Program. The table is divided into two major column groupings. The first, operation scenarios, focuses on the operation of the first and subsequent phases of Alternatives D-1 and D-2. The intent of this column grouping is to identify whether any potential construction- and operation-related effects could occur for the first and subsequent phase. It reflects the worst-case level of impact that could occur. The second major column grouping focuses on any potential construction and/or operation related effects of the specific facilities associated with each Alternative, such as the intake facility, the desalination plant area, the conveyance (pipeline) corridors, and the pump facilities.

5.1 HYDROLOGY AND WATER QUALITY

5.1.1 Introduction

This section describes existing hydrology and water quality in the Program region, including the local climate, watersheds, surface waters, drainages, groundwater, and flood hazards. In addition to detailing the existing conditions in the region, this section discusses the federal, state, and local regulations and standards that govern impacts to hydrology, water quality, and drainage. Following a description of existing conditions and regulations, potentially significant impacts associated with the proposed Program are identified, along with mitigation measures to reduce potential impacts. The potential project effects on ocean water quality in the Monterey Bay are discussed in this section, while the potential effects on marine resources are described in Section 5.2, Marine Resources.

5.1.2 Existing Conditions

Regional Setting

Climate

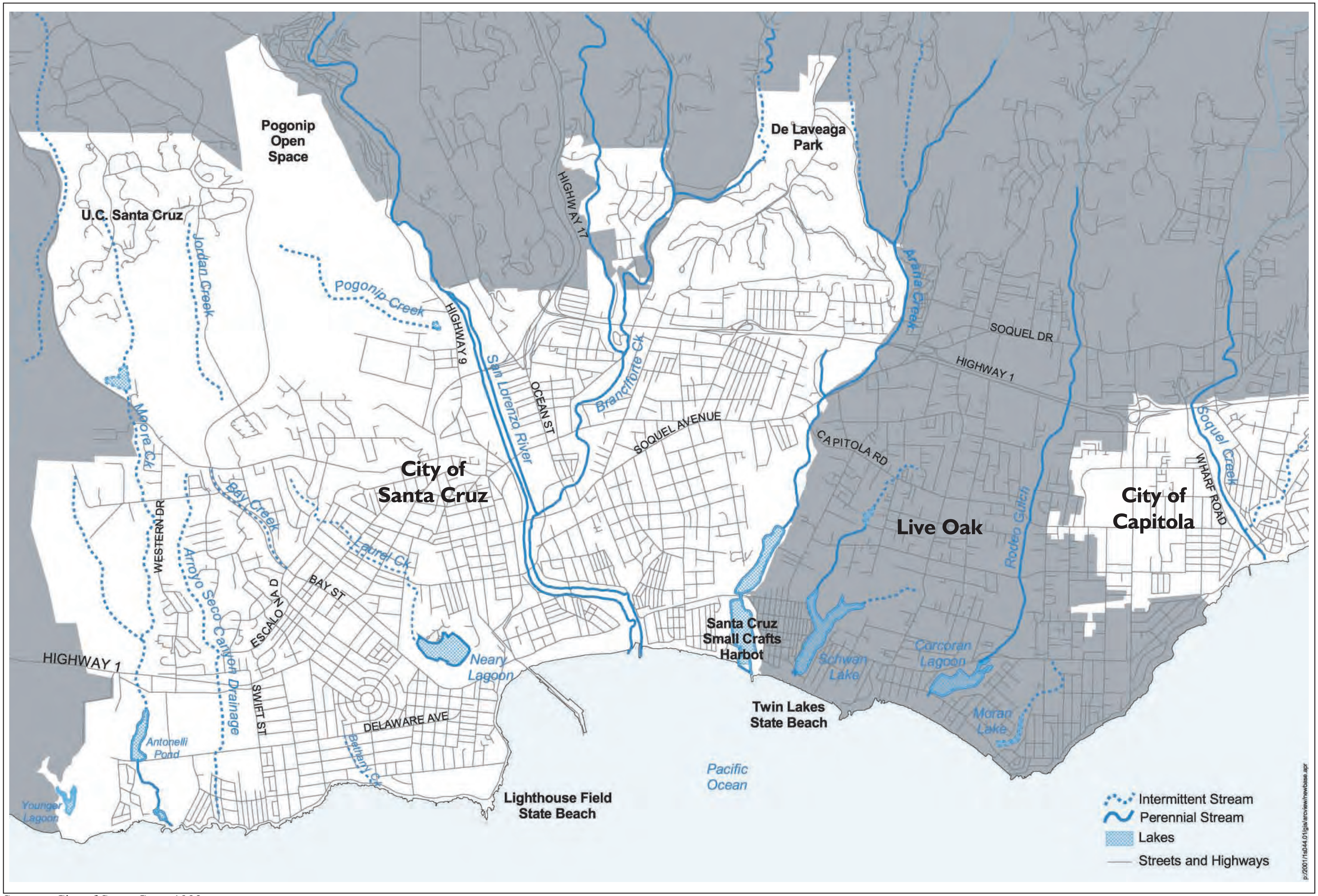
The study area's climate is characterized by warm, dry summers and mild, rainy winters. High temperatures and low precipitation are prevalent from approximately April through October and are caused by high-pressure belts drifting northwards from the subtropics. The months from November through March are dominated by cooler temperatures and heavy rains caused by low-pressure depressions as high-pressure belts retreat. Though winters are typically mild, colder winds from inland regions of continental climates can lead to short-term cold periods in the area. Both summer and winter temperatures are moderated by the oceanic influence, with summer fog being a common occurrence. Rainfall averages 30 inches per year; over the past 20 years, it has ranged from 15 inches in 1989 to 59.8 inches in 1983. Annual evapotranspiration is estimated at 36.6 inches (Golden Gate Weather Service 2003).

Regional Environment (Watersheds)

The study area encompasses portions of the city of Santa Cruz, unincorporated community of Live Oak, and a small portion of the city of Capitola. The entire area is within the Big Basin Hydrologic Unit, as defined by the Central Coast Regional Water Quality Control Board, and includes portions of the San Lorenzo and Aptos Creek Hydrologic subareas (CCRWQCB 1994). At the coast, the San Lorenzo subarea stretches from Younger Lagoon east to the Santa Cruz Harbor at the outlet of Arana Creek. The Aptos Soquel subarea stretches east from the Santa Cruz Harbor to La Selva Beach.

The city of Santa Cruz is divided into five sub-watersheds that make up the San Lorenzo Hydrologic subarea (SWMP 2003). Each drains directly to the Pacific Ocean. These watersheds are depicted in Figure 5.1-1 and are listed below:

- Moore Creek Watershed
- Westside Watershed



Source: City of Santa Cruz, 1992

Not to Scale

FIGURE 5.1-1
Study Area Vicinity Surface Waters

- Neary Lagoon Watershed
- San Lorenzo River Watershed
- Arana Gulch Watershed

Two additional watersheds and a small lake are located in the Aptos Soquel Basin in Capitola and unincorporated areas of Santa Cruz County. These are:

- Rodeo Gulch Watershed
- Soquel Creek Watershed
- Schwann Lake

While some of the creeks in the sub-watersheds have culverted sections, they are for the most part daylighted[1] along their entire lengths. The condition of the riparian corridors varies depending on the creek's location. Moore Creek, for example, has a relatively undisturbed riparian corridor compared to Arroyo Seco Canyon Drainage, which is impacted by culverts, channelization, and housing encroachment. The water quality in all of the study area creeks and channels has not been characterized, but is thought to vary depending on land use in the watersheds. Urban runoff (which typically carries high concentrations of oils, grease, fine sediment, and metals) is one of the main causes of poor water quality in the small local creeks. In addition, some of the creeks and channels in the vicinity of the study area drain from undeveloped areas upstream of the study area, which often results in higher levels of coliform bacteria and suspended solids. Specific information regarding the water quality in each of the study area surface water bodies is not available.

Moore Creek Watershed

The Moore Creek Watershed forms the western boundary of the city of Santa Cruz. The watershed is comprised mainly of open space, including large areas of native oak woodland, and intermittent residential uses. Portions of the UCSC campus drain into Moore Creek. Along its middle reaches, Moore Creek flows on the west side of Western Drive, separated from the road by a riparian and open space corridor of approximately 500 feet. Farther downstream, the creek flows into Antonelli Pond, an artificial impoundment, and crosses Delaware Avenue via a culvert, before terminating at Natural Bridges State Beach. A footpath runs along the western bank of Moore Creek from Highway 1 to the coast. Both native and non-native riparian vegetation are abundant along most of Moore Creek. Younger Lagoon, which drains agricultural fields west of the Terrace Point site, is also considered part of the watershed.

Westside Watershed

The Westside Watershed, located east of the Moore Creek Watershed, is comprised primarily of residential, commercial, and industrial uses with limited open space. Arroyo Seco Canyon Drainage

[1] "Daylighted" refers to streams and creeks that are not enclosed in a culvert or pipe.

is a small seasonal creek that crosses Meder Street south of University Terrace Park. Through the park, the creek is bounded by a riparian buffer of mixed non-native woodland and native oak woodland and riparian scrub (City of Santa Cruz 1992). The drainage is culverted under Highway 1 and emerges south of the highway. Within the Industrial Park Area, the creek was recently realigned and restored by Lipton, Inc. The restored area includes riparian and oak plantings within a 70-foot corridor on either side of the restored channel (EDAW 2003). The drainage continues south under Delaware Avenue and to the ocean. Bethany Creek is a small seasonal creek within the watershed that is daylighted only briefly between Delaware Avenue and West Cliff Drive as it flows through Bethany Curve Green Belt.

Neary Lagoon Watershed

The Neary Lagoon Watershed is located on the eastern edge of the Westside Watershed and is comprised of several creeks, all of which feed into Neary Lagoon before entering Monterey Bay at Cowells Beach. A large part of the watershed drains the UCSC campus via Bay and Laurel Creeks, with residential and commercial use accounting for the remaining portion. Bay Creek is daylighted between Meder Street and Escalona Drive, and along the median of Bay Drive. At Escalona Drive, Bay Creek is culverted until it reaches Neary Lagoon. Donero Creek flows through residential neighborhoods and a school along the western edge of the downtown district before entering Neary Lagoon. During the dry season, water in Neary Lagoon is diverted to the WWTP, which is located on Bay Street to the southwest of the lagoon.

San Lorenzo River Watershed

The San Lorenzo River Watershed, located east of Neary Lagoon Watershed, is the largest watershed in the study area. It consists primarily of open space and includes residential and commercial uses. The San Lorenzo River begins at summit elevations in the Santa Cruz Mountains, flows through the center of the city of Santa Cruz and into the Pacific Ocean. Branciforte Creek converges with the San Lorenzo River near the center of town at the Soquel Avenue Bridge.

Arana Gulch Watershed

The Arana Gulch Watershed forms the city’s eastern border and is partially located within the unincorporated portion of Santa Cruz County. The watershed consists of mixed residential and open space land uses as well as limited commercial use. Arana Gulch is natural with a riparian corridor along most of its reach. It passes through a small wetland before flowing into the Santa Cruz small craft harbor.

Rodeo Gulch Watershed

The Rodeo Gulch Watershed flows through the unincorporated area of Live Oak between the cities of Santa Cruz and Capitola. The watershed consists primarily of open space in the upper watershed, and residential use in the lower reaches. Rodeo Gulch is daylighted for most of its length and flows into Corcoran Lagoon, before terminating at the Pacific Ocean.

Soquel Creek Watershed

Bordering the study area to the east, the Soquel Creek Watershed is the second largest watershed in the local vicinity. Soquel Creek flows through unincorporated portions of Santa Cruz County in its upper watershed, and the center of Capitola as it approaches the ocean. The creek is daylighted throughout its entire length as it flows through open space, residential, and commercial zones. Soquel Creek terminates at Capitola City Beach.

Schwann Lake

Schwann Lake lies near the coast to the east of Santa Cruz Harbor. Its watershed is limited to a small area of mixed open space and residential uses south of Capitola Road.

<u>Regional Groundwater Basins</u>

The Purisima aquifer and Santa Margarita formation underlie the study area.

The Purisima aquifer is the primary source of groundwater in the region. The entire production of the City's Live Oak well field is derived from groundwater contained in the Purisima Formation (Hopkins Groundwater Consultants, Inc. 2004) and accounts for approximately 5 percent of the City's water supply. The primary aquifer units consist of fine-to-coarse grained marine sands interbedded and confined by silt and sandy clay strata (Hopkins Groundwater Consultants, Inc. 2004). The Purisima aquifer is relatively shallow under the City of Santa Cruz, but slopes southeast, becoming deeper under Soquel Creek. Potential groundwater recharge areas for the Purisima aquifer are located along the foothills of the Santa Cruz Mountains in the eastern and northern quarters of the city of Santa Cruz water service area.

The Santa Margarita formation lies beneath the Purisima aquifer; it is believed to be comprised of a moderately cemented sandstone. Available data indicate it likely ranges from 40 to 60 feet thick and lies on top of the crystalline bedrock which defines the effective base of fresh water. In the Live Oak area, the Santa Margarita aquifer is deeply buried and undeveloped.

<u>Marine Water Quality</u>

The City of Santa Cruz has studied the marine environment in the vicinity of its wastewater outfall (Kinnetic Laboratories 1999). These studies (summarized in Kinnetic Laboratories' 1999 report) described the marine environment in the area of the proposed concentrate discharge and seawater intake.

The predominant ocean-water current direction in the study area is to the west (Kinnetic Laboratories 1999). Quarterly water quality profiles indicate the presence of a well-mixed water column in January, a mild to moderate thermocline[2] in April, a moderate to strong thermocline in July, and a diminishing thermocline in October. Quarterly monitoring in 1997 and 1998 revealed that

[2] A thermocline is a layer in a large body of water that sharply separates regions differing in temperature, so that the temperature gradient across the layer is abrupt.

temperature ranged from a low of 9.61 degrees Centigrade (ºC) at the bottom in April to 15.93ºC at the surface in October. Salinity ranged from 31.79 parts per thousand (ppt) on the surface in January of 1998 to 34.02 ppt on the bottom in July 1997. Percent light transmittance ranged from 4.37 percent on the bottom in January 1998 to 82.23 percent at the 80-foot depth contour in July 1997. Dissolved oxygen levels generally decreased with depth. A dissolved oxygen concentration of 4.26 milligrams per liter (mg/l) was recorded near the bottom in July 1997, while a high of 11.1 mg/l was recorded near the surface on that date.

In general, water and sediment quality in the study area is considered good (Kinnetics Laboratories 1999). Elevated levels of bacteria have at times been detected in the vicinity of the wastewater outfall, at the 30-foot depth contour, and in the surf zone (Kinnetics Laboratories 1999). The elevated bacteria level near the outfall was probably related to wastewater discharge. Elevated bacteria at the 30-foot depth contour and in the surf zone were most likely related to runoff. Contaminant levels in sediments in the study area are generally low (Kinnetics Laboratories 1999).

Santa Cruz Wastewater Treatment and Ocean Discharge

Facilities

The City of Santa Cruz currently operates a wastewater collection, treatment, and disposal system that provides service to sewered portions of the City and parts of Santa Cruz County. Municipal wastewater generated within the City limits is delivered to the City's Wastewater Treatment Facility (WWTF) via 206 miles of wastewater mains and 15 pumping stations (City of Santa Cruz 2001). Additionally, the Santa Cruz County Sanitation District of the County Public Works Department collects wastewater from the Live Oak, Capitola, Soquel, Aptos, and Seacliff areas through a system of approximately 200 miles of wastewater mains and 34 pumping stations for treatment at the City's WWTF (City of Santa Cruz 2001).

The plant is located next to Neary Lagoon, just inland from the City's main beach. The design average daily flow of the WWTF is 17 mgd and the design peak wet-weather flows are estimated at 81 mgd. Treated effluent is discharged to the Pacific Ocean via a 10,000+ foot outfall/diffuser system that terminates approximately one mile offshore in 110 feet of seawater. Santa Cruz operates the WWTF under a current National Pollutant Discharge Elimination System (NPDES) permit renewed in 2000 by the CCRWQCB (CA 0048194, Order No. 00-44). Please see Section 5.1.3, Regulatory Framework, below for a description of the CCRWQCB permit process and of Santa Cruz's NPDES permit conditions, which are summarized below to characterize the existing effluent discharge water quality setting.

Flows

Currently, the average daily dry weather flow at the Santa Cruz WWTF is about 9.5 mgd with a peak wet-weather flow on the order of 65.0 mgd. Minimum daily flow in 2001 was approximately 6.0 mgd. Of the average daily flow amount, the City contributes approximately 5.0 mgd and the Santa

Cruz County Sanitation District contributes about 4.5 mgd (City of Santa Cruz 2005). Of this total, about 0.2 mgd is recycled within the treatment plant.

In addition to sewered wastewater collection from the City and County areas, the City of Scotts Valley discharges approximately 1.0 mgd of treated municipal wastewater through the City of Santa Cruz's ocean outfall. Scotts Valley treats its wastewater separately at its own treatment facility under a separate NPDES permit (CA 0048828, Order No. 97-12) but makes joint use of the Santa Cruz ocean outfall facility. Between 1 and 2 mgd of outflow from nearby Neary Lagoon is also treated at the Santa Cruz WWTF between mid- April to mid October. The Santa Cruz WWTF also has a dedicated septage receiving facility that receives approximately 7.0 million gallons of septage per year (or approximately 19 thousand gallons per day) from unsewered areas of Santa Cruz County. Average daily discharge from the outfall from all sources combined is about 11.5 to 12.5 mgd during the dry season.

The amount of wastewater generated in the City and District's service areas is projected to increase from about 10.7 mgd in 2000 to about 12.7 mgd by 2020, about an 18 percent increase (City of Santa Cruz 2001). The City of Scotts Valley projects its wastewater flow will increase from 0.9 mgd in 2000 to 1.5 mgd by 2020, about a 66 percent increase (City of Santa Cruz 2001). By 2020 the total projected combined effluent discharge from the City WWTF and Scotts Valley during the dry season would be approximately 14.2 mgd.

Effluent Characteristics and Quality

Water quality requirements for the City's effluent discharge are established in the City's NPDES permit, which is described in more detail, below in Section 5.1.3, Regulatory Framework. The chief water quality parameters of interest for this project that could be affected by the proposed concentrate disposal are total dissolved solids as well as the concentration of specific metals. Temperature is also of interest. Table 5.1-1 compares four recent years (2000-2003) of effluent quality data monitored at the Santa Cruz WWTF with selected effluent quality requirements established in the City's NPDES permit for key water quality parameters of interest for this project. As shown in the table, the City's effluent complies with permit concentration limitations.

The treated wastewater is discharged into the Pacific Ocean through the existing outfall/diffuser system. The NPDES permit specifies a minimum dilution of 114:1 (parts seawater to effluent) such that effluent leaving the diffuser system effectively mixes with ocean water. The temperature of the existing effluent discharge is warmer than the ambient sea water, estimated to range from 18.0 ^{O}C in winter to 23.0^{O}C in summer, compared to a range of 9.61^{O}C to 15.93^{O}C for sea water. The salinity of wastewater effluent is about 0.5 parts per thousand (ppt), compared to seawater which ranges between 31.79 and 34.02 ppt. The temperature and salinity differences between the effluent and seawater contribute to the mixing and dilution of the effluent once it is discharged, as the warmer, less dense plume of effluent rises through the colder, denser ocean water.

Table 5.1-1
Comparison of Water Discharge Requirements and
Santa Cruz WWTF Effluent Quality Data, 2000-2003.

CONSTITUENT	UNITS OF MEASUREMENT	EFFLUENT LIMITATIONS NPDES PERMIT (30-DAY AVERAGE)	WWTF EFFLUENT QUALITY DATA (YEARLY AVERAGE)			
			2000	2001	2002	2003
BOD	mg/l	<25.0	5.0	6.0	5.7	4.9
Total Suspended Solids	mg/l	<30.0	5.0	4.0	4.6	4.6
CONSTITUENT	UNITS OF MEASUREMENT	TOXIC MATERIALS LIMITATIONS NPDES PERMIT (6-MONTH MEDIAN)	WWTF EFFLUENT QUALITY DATA (YEARLY AVERAGE)			
			2000	2001	2002	2003
Ammonia	mg/l	69	19.0	27.0	21.8	24.0
Cadmium	µg/l	115	<10	<60	<5	<10
Chromium	µg/l	230	<50	<120	<20	<20
Copper	µg/l	117	<10	<60	<50	<60
Lead	µg/l	230	<75	<120	<5	<120
Nickel	µg/l	575	<30	<50	<50	<20
Silver	µg/l	62	<7	<5	<10	<3
Zinc	µg/l	1388	<44	<5	<230	<10
Source: NPDES permit (CA 0048194, Order No. 00-04); Santa Cruz WWTF RWQCB Monitoring Report						

Study Area

A description of hydrology and surface waters in and around the desalination plant sites and conveyance facilities is provided below. For surface waters of concern for particular sites, beneficial uses (as defined by CCRWQCB) are listed (CCRWQCB 1994). State policy for water quality control aims to achieve water quality objectives and discharge prohibitions based on the goal of providing these beneficial uses to the people of California. Table 5.1-2 provides a summary of the beneficial uses of surface water bodies in the vicinity of the study area. Water quality objectives relating to the various beneficial uses are available in the Basin Plan adopted by the CCRWCQB.

Alternatives D-1 and D-2

Desalination Plant Location

Industrial Park Area. The Arroyo Seco Canyon Drainage runs north to south through several lots in the center of the Industrial Park Area, before being culverted under Delaware Avenue. As previously mentioned, Lipton, Inc. funded a channel realignment and restoration project along this reach. A small swale remains along the previous channel alignment. Erosion control measures have been employed along both the swale and restoration sites (EDAW 2003). There are no listed beneficial uses for the Arroyo Seco Canyon Drainage (CCRWQCB 1994).

According to the Federal Emergency Management Agency's (FEMA) flood plain maps and the City's General Plan, the Industrial Park Area does not lie within the 100-year flood zone (FEMA

1985-86 and 1989) and is not subject to the risk of flooding from tsunami or tidal action (City of Santa Cruz 1990). While the restored Arroyo Seco Canyon Drainage Channel has not been assessed by FEMA, field inspection indicates that the channel is deep and would accommodate a large flooding event (EDAW 2003). Flood risk is therefore low, with the exception of potential infrequent flooding due to construction, or clogging of storm drainages, culverts, or pipelines associated with existing structures and streets.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is adjacent to Moore Creek and Antonelli's Pond. The beneficial uses of Moore Creek and Antonelli's Pond are listed in Table 5.1-2.

FEMA floodplain maps indicate that a small strip along the eastern edge of the property lies within the 100-year flood zone of Moore Creek (FEMA 1985-86 and 1989). The City's General Plan indicates that the Shaffer Road/Antonelli's Pond Area is not subject to the risk of flooding from tsunami or tidal action (City of Santa Cruz 1990). Therefore, flood risk is considered low on most of the property.

Terrace Point Area. The Terrace Point Area is adjacent to and east of Younger Lagoon. The beneficial uses of Younger Lagoon are listed in Table 5.1-2.

According to FEMA's flood plain maps and the City's General Plan, the Terrace Point Area does not lie within the 100-year flood zone (FEMA 1985-86 and 1989) and is not subject to the risk of flooding from tsunami or tidal action (City of Santa Cruz 1990). Flood risk is therefore low, with the exception of potential infrequent flooding due to construction, or clogging of storm drainages, culverts, or pipelines associated with existing structures and streets.

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1). The raw water intake pipeline crosses Arroyo Seco Canyon Drainage at Delaware Avenue and Moore Creek just below Antonelli's Pond on Delaware Avenue. However, the latter crossing is only of concern if the desalination plant is located within the Shaffer Road/Antonelli's Pond or Terrace Point Areas. Where the corridors cross creeks, they also pass through the 100-year floodplain of those surface waters.

Junction Structure. The existing junction structure, located at the base of the sea cliffs on West Cliff Drive and adjacent to the Pacific Ocean (Figures 4-4 and 4-5 in Chapter 4, Program Description), is not close to any freshwater surface water features. Beneficial uses of the Pacific Ocean, as defined by the State Water Resources Control Board (SWRCB)[3], include:

- Industrial water supply
- Water contact, and non-contact recreation, including aesthetic enjoyment

[3] Note that the Pacific Ocean is not designated by the SWRCB to provide the beneficial use of municipal and domestic supply.

Table 5.1-2
Beneficial Uses of Surface Water Bodies Crossing or in Close Proximity to Program Components

SURFACE WATER BODY	BENEFICIAL USES	ASSOCIATED PROGRAM COMPONENTS
Moore Creek	MUN, AGR, GWR, REC1, REC2, WILD, COLD, WARM, SPWN, BIOL, FRESH, COMM	Shaffer Road/Antonelli's Pond Area, and Corridors 1, 2, 3, and 4
Antonelli's Pond	GWR, REC1, REC2, WILD, WARM, MIGR, SPWN, RARE, COMM	Shaffer Road/Antonelli's Pond Area, and Corridors 1, 2, 3, and 4
Younger's Lagoon	GWR, REC1, REC2, WILD, COLD, WARM, SPWN, BIOL, COMM	Terrace Point Area
Arroyo Seco Canyon Drainage	None	Industrial Park Area, Corridors 1, 2, 3 and 4
Bethany Creek	None	Corridor 4
Bay Creek	None	Corridor 3
Branciforte Creek	MUN, AGR, IND, GWR, REC1, REC2, WILD, COLD, MIGR, SPWN, BIOL, RARE, FRESH, COMM	Corridors 5 and 7
Arana Gulch	MUN, GWR, REC1, REC2, WILD, COLD, MIGR, SPWN, RARE, FRESH, COMM	Corridors 5, 6, and 7
Rodeo Gulch	MUN, AGR, IND, GWR, REC1, REC2, WILD, COLD, SPWN, FRESH, COMM	Corridors 5, 6, and 7
Schwann Lake	REC1, REC2, WILD, WARM, SPWN, BIOL, RARE, COMM, SHELL.	Corridor 7
Pacific Ocean	IND, REC1, REC2, NAV, COMM, mariculture, preservation, and enhancement of designated Areas of Biological Significance, RARE, marine habitat; MIGR, SPWN and SHELL	Raw Water Intake

Source: CCRWQCB 1994; SWRCB 2001

Definitions of Beneficial Use Acronyms:

AGR – Agricultural Supply
BIOL – Preservation of Biological Habitat of Special Significance
COLD – Cold Freshwater Habitat
COMM – Commercial and Sport Fishing
EST – Estuarine Habitat
FRESH – Freshwater Replenishment
GWR – Ground water Recharge
IND – Industrial Service Supply
MIGR – Migration of Aquatic Organisms
MUN – Municipal and Domestic Supply
NAV – Navigation
RARE – Rare, Threatened, or Endangered Species
REC-1 – Water Contact Recreation
REC-2 – No-Contact Water Recreation
SHELL – Shellfish Harvesting
SPWN – Spawning, Reproduction, and/or Early Development
WARM – Warm Freshwater Habitat
WILD – Wildlife Habitat

- Navigation
- Commercial and sport fishing
- Mariculture[4]
- Preservation and enhancement of designated areas of special biological significance
- Rare and endangered species
- Marine habitat
- Fish migration
- Fish spawning
- Shellfish harvesting

Treated Water Distribution Pipeline (Corridor 2). The treated water distribution pipeline (Corridor 2) begins along the same alignment as Corridor 1. Creek crossings within the shared corridor sections are described above. In addition, Corridor 2 crosses Arroyo Seco Canyon Drainage again at Mission Street and Meder Street south of University Terrace Park. Just before reaching the Bay Street Reservoir, Corridor 2 crosses Bay Creek at Meder Street and Bay Street. There are no listed beneficial uses for Bay Creek (CCRWQCB 1994).

Treated Water Distribution Pipeline (Corridor 3). The treated water distribution pipeline (Corridor 3) begins along the same alignment as Corridor 1. Creek crossings within the shared corridor sections are described above. In addition, Corridor 3 runs adjacent to the daylighted reach of Bay Creek between Escalona Drive and Meder Street.

Concentrate Discharge Pipeline (Corridors 1 and 4). The concentrate discharge pipeline consists of both Corridors 1 and 4. Corridor 1 is described above. Corridor 4 continues east along Delaware Avenue, crossing Bethany Creek at Bethany Curve Green Belt on its way to the WWTP. There are no listed beneficial uses for Bethany Creek (CCRWQCB 1994).

<u>Alternative D-2</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. The pipeline corridors begin at the junction of Water Street and Ocean Street, one block west of the San Lorenzo River (see Figure 4-8 in Chapter 4, Program Description). This location is below the first marine terrace, but is not within the 100-year floodplain of nearby Branciforte Creek or the San Lorenzo River. Heading south on Ocean Street, Corridor 7 crosses through the 100-year floodplain of the San Lorenzo River. Corridors 5 and 6 cross Branciforte Creek, a tributary of the San Lorenzo River, at Water Street and Ocean Avenue, respectively. Further east, Corridors 5, 6, and 7 cross Arana Gulch at Soquel Avenue, Capitola Road, and Murray Street, respectively. Corridors 5, 6, and 7 also cross Rodeo Gulch at Soquel Drive, Capitola Road, and Kinsley Street, respectively. Corridor 7 passes to the north of Schwann Lake

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[4] Mariculture is the cultivation of plants and animals in marine waters independent of any pollution source.

along the Southern Pacific Rail line. The location of the pumping facility has not yet been determined.

Beneficial uses of Branciforte Creek, Arana Gulch, Rodeo Gulch, and Schwann Lake are listed in Table 5.1-2.

5.1.3 Regulatory Framework

Any project within the scope of the IWP would be subject to federal, state, and local regulations pertaining to water quality, pollutant emissions, and drainage. Regulations pertaining to hydrology and water quality in the study area are detailed below.

Federal

The Federal Clean Water Act (CWA)

The CWA is the primary surface water protection legislation throughout the country. By employing a variety of regulatory and nonregulatory tools, including establishing water quality standards, issuing permits, monitoring discharges, and managing polluted runoff, the CWA aims to restore and maintain the chemical, physical, and biological integrity of surface waters to support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." The CWA regulates both the pollutant content of point-source discharges as well as addressing polluted runoff (EPA 2003a).

The proposed Program is subject to regulations governing discharge from point sources and "wet weather point sources," such as urban storm sewer systems and construction sites, as defined in Sections 1311–1330 of the CWA (Title 33, Chapter 26, Subchapter III of the United States Code). In addition, the proposed Program may be subject to a number of permit requirements, including a National Pollutant Discharge Elimination System (NPDES) permit, a Construction Activities Storm Water Permit, and a Sections 401/404 permit. Any necessary permits will be obtained prior to implementation of the proposed Program.

Section 401

Section 401 of the CWA requires that state water quality standards be met and that construction, dredging, and disposal activities not cause concentrations of chemicals in the water column that exceed state standards. Section 401 requires a water quality certification from the Regional Water Quality Control Board (RWQCB) for issuance of a 404 permit. Because the proposed Program would require a Section 404 permit, it would require 401 certification.

Section 402

Section 402 of the CWA states that discharge of pollutants to waters of the United States is unlawful unless the discharge is in compliance with an NPDES permit. The discharge of concentrate through the existing City of Santa Cruz wastewater outfall would require a modification of the existing

NPDES permit for the wastewater outfall. The discharge would be required to comply with limitations in the *California Ocean Plan* (Table 5.1-3) beyond the zone of initial dilution.

Section 404

Under Section 404 of the CWA, disposal of dredge and fill material into waters of the United States requires a permit. The permitting agency is the U.S. Army Corps of Engineers. Under Section 404(b)(1) Guidelines, an application must include an evaluation of the impacts on the affected resources. Implementation of any modification to the 36-inch outfall for the intake of seawater may require a Section 404 permit due to the likely need to dredge or move sediment on the ocean floor around the intake structure.

<u>Rivers and Harbors Act of 1989</u>

The Rivers and Harbors Act of 1989 (Section 10) requires that a permit be obtained from the U.S. Army Corps of Engineers for structures or work in navigable waters of the United States if the structures or work could constitute an obstruction or alteration of the navigable waters. The proposed Program would require a Section 10 permit because it would involve construction of a seawater intake in the navigable waters of the Pacific Ocean. The Corps of Engineers processes Section 10 permits simultaneously with Section 404 permits because they have similar requirements.

State

<u>The State Water Resource Control Board and Regional Water Quality Control Boards</u>

The SWRCB and RWQCBs are responsible for preserving, enhancing, and restoring "the quality of California's water resources and ensuring their proper allocation and efficient use for the benefit of present and future generations" (SWRCB 2003). SWRCB makes statewide regulations governing water use and point source and nonpoint source pollutant discharge, while the RWQCBs work in smaller regions throughout the state to implement SWRCB policies and regulations. RWQCBs also establish additional region- and area-specific regulations and policies to achieve water quality goals. The SWRCB adopted the *California Ocean Plan* in 1972 to provide control for the discharge of waste to ocean waters and ensure the protection of beneficial uses of ocean waters. The plan was last amended in 2001 (SWRCB 2001). Table 5.1-3 below shows selected water quality objectives established in the *California Ocean Plan* for protection of marine aquatic life. The plan also sets forth objectives for bacterial, physical, chemical, and biological characteristics for ocean waters. Compliance is determined from samples collected within the waste field where initial dilution is completed. In cases where there is conflict between limitations set forth in the *California Ocean Plan* and those set forth in other federal or state legislation, the more stringent limitations apply.

Table 5.1-3
California Ocean Plan – Water Quality Objectives for Protection of Marine Aquatic Life

CONSTITUENT	LIMITING CONCENTRATIONS			
	UNITS OF MEASUREMENT	6-MONTH MEDIAN	DAILY MAXIMUM	INSTANTANEOUS MAXIMUM
Arsenic	µg/l	8	32	80
Cadmium	µg/l	1	4	10
Chromium (Hexavalent)	µg/l	2	8	20
Copper	µg/l	3	12	30
Lead	µg/l	2	8	20
Mercury	µg/l	0.04	0.16	0.4
Nickel	µg/l	5	20	50
Selenium	µg/l	15	60	150
Silver	µg/l	0.7	2.8	7
Zinc	µg/l	20	80	200
Cyanide	µg/l	1	4	10
Total Chlorine Residual	µg/l	2	8	60
Ammonia (expressed as nitrogen)	µg/l	600	2400	6000
Acute Toxicity	TUa	N/A	0.3	N/A
Chronic Toxicity	TUc	N/A	1	N/A
Phenolic Compounds (nonchlorinated)	µg/l	30	120	300
Chlorinated Phenolics	µg/l	1	4	10
Endosulfan	µg/l	0.009	0.018	0.027
Endrin	µg/l	0.002	0.004	0.006
Hexacyclohexane	µg/l	0.004	0.008	0.0012

Source: SWRCB, California Ocean Plan 2001.
Notes: µg/l = micrograms per liter; TUa = toxicity unit acute; TUc = toxicity unit chronic

The study area lies in the Central Coast Hydrologic Region and is governed by the Central Coast RWQCB. The RWQCB's *Water Quality Control Plan* (Basin Plan), last updated in 1994, identifies the existing and potential beneficial uses of surface and groundwater in the region, as well as water quality objectives and implementation measures throughout the basin. The plan includes water quality objectives and implementation measures for water quality parameters, including the following:

- Bacteria content
- Nutrient and biostimulatory substances content
- Chemical constituent

- Color
- Dissolved oxygen content
- Floating material
- Oil and grease
- pH
- Pesticide content
- Radioactivity
- Salinity
- Settleable materials content
- Suspended materials content
- Taste and odor
- Temperature
- Toxicity
- Turbidity

The Basin Plan provides water quality criteria for the beneficial uses listed in the watersheds section for each surface water body in the study region.

For projects over one acre or with the potential to result in stormwater pollution, the RWQCB requires preparation of a stormwater pollution prevention plan (SWPPP). The SWPPP incorporates best management practices (BMPs) to minimize impacts on water quality from development and construction activities. A SWPPP would likely be required for construction of the various facilities associated with the proposed Program.

Local

Existing NPDES Permit

The Central Coast RWQCB has issued a NPDES permit (Permit No. CA 0048194, Order No. 00-44) to the City of Santa Cruz Wastewater Treatment Facility and Local Sewering Agencies of Santa Cruz County Sanitation District authorizing the wastewater discharge. The permit was last updated in March 2000.

The permit mandates a removal efficiency for total suspended solids and carbonaceous biochemical oxygen demand of not less than 85 percent, and sets effluent limitations for metals, chlorine residual, ammonia, toxicity, phenolic compounds, and other constituents for the protection of marine aquatic life. 24 non-carcinogenic and 34 carcinogenic chemicals are also regulated for protection of human health. Table 5.1-4 summarizes the City's NPDES permit effluent limitations for selected constituents. In addition, the permit states that effluent shall be essentially free of materials and substances that:

- Float or become floatable upon discharge
- Form sediments that degrade benthic communities or other aquatic life
- Accumulate to toxic levels in marine waters, sediment, or biota
- Decrease the natural light to benthic communities and other marine life
- Result in aesthetically undesirable discoloration of the ocean surface

Table 5.1-4
Santa Cruz NPDES Permit Effluent Limitations

CONSTITUENT	UNIT OF MEASURE	30-DAY AVERAGE	7-DAY AVERAGE	DAILY MAXIMUM
CBOD[a]	mg/l	25	40	n/a
Total Suspended Solids[a]	mg/l	30	45	n/a
Oil and Grease	mg/l	25	40	75
Settleable Solids	mg/l	1.0	1.5	3.0
Turbidity (NTU)	NTU	75	100	225
pH	Units	N/A	N/A	Between 6.0 and 9.0 at all times.
Total Coliforms	MPN/100 ml	N/A	N/A	100,000
Fecal Coliform	MPN/100 ml	N/A	N/A	20,000
Enterococcus	MPN/100 ml	N/A	N/A	2,400
Acute Toxicity	TUa	1.5	2.0	2.5

Source: NPDES permit (CA 0048194, Order No. 00-04).
Note: mg/l = milligrams per liter; TUa = toxicity unit acute; NTU = nepthelmetric unit

The NPDES permit also sets receiving water limitations such that the discharge shall not cause certain water quality objectives to be violated upon completion of initial dilution. The receiving water limitations address physical and chemical characteristics of the receiving water, including temperature, dissolved oxygen, pH, nutrients, organic material, and dissolved sulfide, as well as biological characteristics including prohibitions on "degradation" to vertebrate, invertebrate, and plant communities, alteration of the natural taste, odor, and color of marine resources used for human consumption, and the bioaccumulation to toxic levels of organic material in marine resources used for human consumption.

Under the findings of the permit, the outfall diffuser configuration is documented as achieving a minimum dilution of 114:1 (parts seawater to effluent) such that effluent leaving the diffuser system effectively mixes with ocean water.

A detailed monitoring and reporting program is required under the NPDES permit to analyze short- and long-term effects of the discharge on receiving waters, sediments, biota, and beneficial uses of the receiving water, and to assess compliance with the NPDES permit and the *California Ocean*

Plan. The NPDES permit also requires that notification be made of any new industrial users that discharge to the wastewater treatment facilities or the outfall.

The City of Santa Cruz General Plan and Local Coastal Program

The *City of Santa Cruz General Plan and Local Coastal Program* details the City's policies regarding water quality and hydrology in its Environmental Quality and Safety Elements. Additional policies that are pertinent to the IWP are listed in the *Moore Creek Corridor Management and Access Plan,* which appears in the Area and Specific Plan Summaries section of the General Plan. These pertain in particular to the Shaffer Road/Antonelli's Pond Area, as it lies within the Moore Creek corridor. Three additional specific area plans included in the General Plan (*Natural Bridges State Beach Plan*, *Neary Lagoon Management Plan*, and *San Lorenzo River Enhancement and Design Plan*) were reviewed and determined not to have policies relating directly to the hydrology and water quality components of the IWP.

The Safety Element of the General Plan discusses the City's policies regarding flood hazards, including stormwater drainage, tsunami, and dike and dam failure. The Environmental Quality Element discusses policies regarding the water quality in the ocean and the local creeks and channels. The specific goals and policies are provided in Appendix B of this document.

The City of Capitola General Plan and Local Coastal Program

The *City of Capitola General Plan and Local Coastal Program* describes the City's policies regarding water quality and hydrology in its Conservation Element. These policies are provided in Appendix B.

Santa Cruz County General Plan and Local Coastal Program

The *Santa Cruz County General Plan and Local Coastal Program* describes the City's policies regarding geology, soils, and seismicity in its Conservation and Open Space, Public Safety and Noise, and Parks and Recreation and Public Facilities Elements. The Conservation and Open Space Element discusses the County's policies regarding water and hydrological resources; the Public Safety and Noise Element discusses erosion and flood hazard; and the Parks and Recreation and Public Facilities Element discusses water supply. Appendix B identifies specific policies that are applicable to the proposed Program.

5.1.4 Impacts and Mitigation Measures

Significance Criteria

Actions associated with the proposed Program could have a significant impact on water resources if they would:

- Violate any water quality standards or waste discharge requirements; create or contribute runoff water that would provide substantial additional sources of polluted runoff; or otherwise substantially degrade water quality;

- Substantially alter the existing drainage pattern of the site or area or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site; place within a 100-year flood hazard area (as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map) structures that would impede or redirect flows; or expose people or structures to a significant risk of loss, injury, or death involving flooding;
- Expose people or structures to a significant loss, injury, or death by seiche waves,[5] tsunami, or mudflow; or
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that the net storage of the aquifer would be reduced, subsidence would occur, well interference would occur, surface water flows would be depleted, or seawater intrusion would occur.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Evaluation of potential desalination facility expansion to 3.5 and 4.5 mgd (subsequent increments) is also provided where relevant. Table 5.1-5 summarizes the potential impacts.

[5] A wave that oscillates in lakes, bays, or gulfs at a frequency of a few minutes to a few hours as a result of seismic or atmospheric disturbances.

Table 5.1-5
Summary of Potential Impacts – Hydrology and Water Quality

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FAC.		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP. FAC.	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALT D-2 PUMP FAC.
Impact 5.1-1: Construction effects on water quality of surface water.	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.1-2: Discharge of seawater concentrate from the desalination plant could affect the water quality of the Pacific Ocean.	◐	◐	◐	◐	--	◐	--	--	--	--	--	--	--	--	--	--	--
Impact 5.1-3: Storage, use, and disposal of chemicals at the desalination facility could affect water quality of nearby surface waters, the Pacific Ocean, and the Monterey Bay National Marine Sanctuary.	◐	◐	◐	◐	--	◐	--	--	--	--	--	--	--	--	--	--	--
Impact 5.1-4: The Proposed Program could place structures in flooding hazard zones, thereby exposing people and structures to the risk of injury or loss, or could alter drainage and runoff characteristics such that downstream flood hazards would be increased.	◐	◐	◐	◐	○	◐	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

(continued on next page)

Table 5.1-5 (continued)
Summary of Potential Impacts – Hydrology and Water Quality

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FAC.		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP. FAC.	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALT D-2 PUMP FAC.
Impact 5.1-5: The Proposed Program could impact the water quality of nearby surface waters through stormwater runoff from developed impermeable surfaces and landscape applications.	○	○	○	○	--	○	○	○	○	○	○	○	○	○	○	○	○
Impact 5.1-6: The Proposed Program could affect local and regional groundwater supply by reducing the net storage of the aquifer, causing well interference, depleting surface water flows, causing seawater intrusion, or inducing ground subsidence.	◐	○	◐	◐	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: EDAW 2003 Notes: -- = Not Applicable; ○ = Less Than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1] Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

[2] Impacts associated with the specific facilities of the desalination plant.

Impacts and Mitigation

⌧ **Impact 5.1-1: Construction Effects on Water Quality of Surface Water. Less than significant with EIR-Identified Mitigation.**

General Discussion (Applicable to all Increments of both Alternatives)

There are many surface waters throughout the study area, ranging from small creeks, lakes, and lagoons to large rivers. Runoff from areas of construction would drain directly to one or more of these waterbodies and eventually to the Pacific Ocean and the Monterey Bay National Marine Sanctuary. Construction activities, including grading, vegetation removal, excavation, and dewatering, have the potential to affect surface water quality in several ways. Disturbed soils could be exposed to the erosive forces of wind, rain, and stream flow. Erosion and subsequent sedimentation could reduce the water quality of nearby waterbodies. Sediment deposition occurring in or obstructing water flow to storm drains could cause subsequent flooding. In addition to sedimentation issues, contamination of runoff water with other hazardous chemicals such as fuels, oils, lead solder, solvents, and glues could occur through the daily use, transportation, and storage of these materials during construction.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Raw Water Intake. The raw water intake system is located in the Pacific Ocean. Disturbance of bottom sediments during construction has the potential to affect marine organisms and water quality down-current of the construction site. In addition, any chemicals, including fuel, oil, and solder, that are stored on the staging barge have the potential to impact local water quality if a spill occurs.

Desalination Plant. The Arroyo Seco Canyon Drainage runs in this area through a section of the Industrial Park Area and could be affected by nearby construction activities. Moore Creek and Antonelli’s Pond are the main waterbodies of concern at the Shaffer Road/Antonelli’s Pond Area. Depending on the final location of the Terrace Point Area, construction in this area has the potential to affect Younger Lagoon or Moore Creek.

Conveyance and Pumping Facilities. Open-trench pipeline construction could directly affect surface water quality if it occurs through drainages where there is stream flow. Construction of the pipelines and pump stations would also result in sedimentation to nearby creeks from runoff (soil erosion of stockpiles). Furthermore, chemical spills associated with operation of heavy machinery could occur during construction activities. Conveyance of sediment and other pollutants from the construction site to the drainages could occur by direct overland flow or via the storm drain system. Construction activities through a drainage would require appropriate permits from the U.S. Army Corps of Engineers, RWQCB, and the California Department of Fish and Game. Please refer to Section 5.4, Biological Resources. Compliance with permit conditions would reduce potential impacts to surface waters.

Sections of pipeline constructed using jack and bore methods could require use of a mixture of bentonite clay and petroleum as a lubricant for the boring device. Use of these compounds would depend on the sediment and rock material encountered during boring. Both bentonite clay and petroleum have the potential to adversely affect water quality in nearby streams. Jack and bore techniques are expected to be necessary at a limited number of locations, including pipeline crossings at main thoroughfares, railroads, and large rivers. In addition, any tunneling or drilling that occurs under an existing creekbed has the potential to affect the creekbed.

Raw Water Intake Pipeline (Corridor 1). Depending on the final alignment, the raw water pipeline would cross up to two drainages: Moore Creek and Arroyo Seco Canyon Drainage. As discussed above, there is a potential to cause sedimentation and other water quality degradation in these creeks from nearby construction.

Treated Water Distribution Pipeline (Corridors 2 and 3). Depending on the final alignment, the treated water distribution pipeline would cross up to three drainages: Moore Creek, Arroyo Seco Canyon Drainage, and Bay Creek.

Concentrate Discharge Pipeline (Corridors 1 and 4). Depending on the final alignment, the concentrate discharge pipeline would cross up to three drainages: Moore Creek, Arroyo Seco Canyon Drainage, and Bethany Curve Creek. Potential impacts would be similar to those identified above.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility. In addition to the facilities described above, Alternative D-2 would also include distribution pipelines and a pumping facility. Installation of these facilities could result in water quality effects associated with construction activities. Depending on the final location, sediment and other pollutants from construction activities could affect San Lorenzo Creek, Arana Gulch, Schwann Lake, Rodeo Gulch, and Corcoran Lagoon.

<u>Alternatives D-1 and D-2 (Applicable to the Subsequent Increments of both Alternatives)</u>

The construction-related impacts of the subsequent increment expansions would be the same as those for the first increment of Alternatives D-1 and D-2. At some point in the future, however, minor construction to install additional reverse osmosis (RO) units would occur. This construction would require additional permitting.

<u>Mitigation Measures</u>

Mitigation Measures 5.1 would apply to all program components.

Mitigation Measure 5.1-1a: This mitigation measure applies to all components of the proposed Program. The Central Coast RWQCB specifies that any project with a combined disturbance area of over one acre requires a NPDES Construction Activity Stormwater Permit. As part of the NPDES permit, a SWPPP must be developed. The City shall require contractors to prepare and implement a SWPPP that identifies BMPs to prevent or reduce pollution into surface waters.

BMPs could include use of water filters over storm drains; construction or installation of sediment retention or erosion control structures such as hay bales, coconut fiber rolls, geofabric, or sand bags; reseeding of areas where vegetation has been removed or new sediment has been used as fill; stockpiling of topsoil removed during construction; and wetting of dry and dusty surfaces to prevent fugitive dust emissions. The SWPPP also establishes specific fueling areas for construction vehicles, handling procedures for hazardous materials, and revegetation following construction. For many of the BMPs, installation must take place before a specific date (usually October 15th, representing the onset of the rainy season), and regular maintenance is required until the end of the rainy season (usually April 15th). Additional requirements components of the SWPPP include monitoring, sampling, and annual reporting to show compliance with the NPDES Construction Activity Stormwater Permit.

Refer to Mitigation Measures 5.11-1a, 5.11-1b, and 5.11-2 for construction mitigation related to the release of hazardous materials, including bentonite clay and petroleum-based chemicals.

Refer to Mitigation Measure 5.4-6b regarding the acquisition of permits from relevant agencies and compliance with permit conditions to reduce potential water quality impacts to surface waters.

Mitigation Measure 5.1-1b: Grading areas shall be clearly marked, and no equipment or vehicles shall disturb areas outside of the grading areas.

Mitigation Measure 5.1-1c: The City shall limit construction at the beach to periods when tidal elevation does not affect the construction zone.

Mitigation Measure 5.1-1d: Contractors shall implement specific measures that reduce sediment disturbance during underwater construction. These could include, but not be limited to the following: employ hydraulic rather than mechanical dredging systems; cease work during periods of high swell (such as for the period from October 15 through February 15 due to the high incidence of large swells); avoid work during extreme high tides, or during other periods of extreme tidal fluctuations such as during full and new moons; and employ sea curtains if appropriate.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.1-2: Discharge of seawater concentrate from the desalination plant could affect the water quality of the Pacific Ocean. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to all Increments of both Alternatives)

The following discussion of concentrate discharge, dilution and storage is based on analysis performed by Brown and Caldwell reported in a memorandum in June 2004. The full memorandum is included in Appendix C.

Concentrate Discharge

The seawater concentrate produced from the desalination facility would be mixed with wastewater effluent from the WWTP and then discharged to the ocean through the City's existing deep water outfall and diffuser facility. The combination of seawater concentrate and wastewater effluent is referred to in this report as composite effluent.

Seawater concentrate would be generated continuously whenever the desalination plant is in operation. Anticipated concentrate flows from the proposed desalination project are 3.1 mgd for the 2.5-mgd facility and 4.3 mgd for the 3.5-mgd facility. These estimates assume a rejection rate from the desalination facility of 55 percent. The estimated temperature and salinity of the seawater concentrate is compared to the existing wastewater quality in Table 5.1-6. As indicated in the table, seawater concentrate would have a lower temperature and a higher salinity than the existing wastewater effluent. The salinity of the concentrate is expected to be roughly twice that of ocean water. Wastewater effluent, by comparison, has a very low salt concentration.

Table 5.1-6
Comparison of Existing Wastewater Effluent Quality and Projected Seawater Concentrate Quality

PARAMETER	WASTEWATER EFFLUENT	SEAWATER CONCENTRATE	COMPOSITE EFFLUENT
TEMPERATURE, °C	18.0 - 23.0	12.3 - 12.8	< Wastewater effluent alone
SALINITY, PPT	0.5	61.4	28 - 32

Source: Brown and Caldwell June 2004

As discussed in the Section 5.1.2 Existing Conditions and Section 5.1.3 Regulatory Framework, above, the City's wastewater discharge is regulated by a NPDES permit that establishes requirements for effluent quality and receiving water quality in order to protect both aquatic resources and human health. The combination of concentrate to the wastewater effluent could have a significant impact on ocean water quality and, in turn, on the marine environment, if it caused the City to violate its NPDES permit conditions for ocean discharge. However, the composite effluent combination is not expected to exceed the NPDES effluent limitations, because the addition of seawater concentrate flow to the wastewater discharge will tend to dilute waste constituents regulated under the NPDES permit, which are currently well below permit limits. Trace metal concentrations in seawater concentrate are expected to be less than effluent trace metal concentrations. Thus, the addition of concentrate to effluent will lower the trace metal concentrations discharged to the ocean, and concentrations in the composite effluent will remain far below effluent limits (Brown and Caldwell 2004). In fact, it may provide some benefit to the marine environment by making the salinity of the discharge closer to ocean salinity, in contrast to the existing condition in which relatively fresh wastewater is discharged to the ocean.

Concentrate Dilution

For a deep-water ocean outfall, wastewater dilution is achieved through the momentum of the discharge and the buoyant rise of the plume through the water column, which act together to produce turbulent mixing. In general, the higher the density difference and larger the temperature difference between the effluent plume and the ocean water, the greater the dilution. As shown in Table 5.1-6, the composite effluent plume would have a higher salinity and a lower temperature than the existing wastewater effluent plume. The salinity of the composite effluent, however, would still be lower than that of ambient ocean water (28 to 32 ppt versus 34 ppt). Likewise, the composite effluent plume would be denser than the existing wastewater plume, but less dense than ambient seawater and therefore remain positively buoyant at all times. With proper mixing of effluent and concentrate, the plume would continue to rise up in the water column, mixing and diluting into the ocean water as it rises. Once discharged it would rapidly approach the salinity of ocean water as the composite effluent plume mixed with surrounding ocean water (Brown and Caldwell 2004).

The City has conducted detailed dilution modeling (using the PLUMES model in conjunction with the RSB Dilution Model) to establish the proper blend rate and schedule for concentrate disposal with the wastewater effluent. This modeling determined that if the amount of concentrate added to the effluent is roughly equal to the effluent flow, the composite effluent plume would remain buoyant enough to achieve the required dilution of 114:1 (Brown and Caldwell 2004). The modeling used several worst-case scenario assumptions to conservatively estimate effluent flow available to mix concentrate with, including a minimum effluent flow of 5 mgd. From the modeling it was determined that the maximum concentrate flow from the desalination plant that could be added to wastewater effluent (while still meeting the required minimum dilution factor of 114:1) ranges between 85 and 115 percent of the wastewater effluent flow rate, depending on the time of year. The composite effluent discharge would therefore consist of approximately one part wastewater effluent and one part concentrate.

For the 2.5-mgd desalination facility, the dilution factor that can be achieved upon ocean discharge of the composite effluent ranges from around 150:1 to 260:1, and the average daily dilution factor is 214:1. For the 3.5-mgd facility, the dilution factor ranges from around 130:1 to 220:1, with an average daily dilution factor of 161:1. In addition, taking into account that the wastewater effluent was initially diluted 2:1 by the concentrate, the resulting minimum dilution factors of the wastewater effluent are actually closer to 300:1 and 260:1 for the 2.5- and 3.5-mgd facilities, respectively, well above the 114:1 minimum dilution requirements established in the NPDES permit.

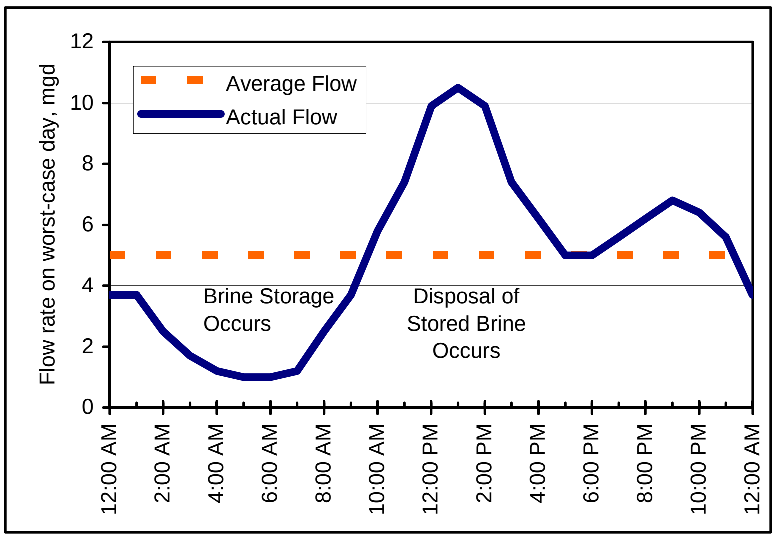
Concentrate Storage
From the analysis of proper concentrate/effluent blending ratios, the City determined that equalization storage would be needed at certain times when there is not adequate effluent flow from the WWTF to provide for adequate mixing with the concentrate being generated by the desalination facility. During low wastewater flow periods concentrate storage may be necessary to assure adequate dilution of concentrate with wastewater. The required storage volumes were calculated for both 2.5 and 3.5 mgd desalination facilities. The calculations were based on several conservative assumptions including:

- A future worst-case effluent flow scenario of 5 mgd was used based on minimum effluent flow rates observed during the most recent severe drought in 1989 and 1990. It is therefore a conservative assumption which is below the minimum, average, and maximum effluent flow rates in 2001 of roughly 6, 11, and 31 mgd.
- Concentrate storage requirements were based on maintaining the minimum dilution factor of 115 at the worst performing section of the outfall. Dilution averaged over the entire outfall is likely to be better than levels presented in this report by roughly 10 percent.
- The recommended storage volumes for both the 2.5- and 3.5-mgd desalination facility include a safety factor of approximately 1.2.
- Dilution of the wastewater effluent with the concentrate prior to discharge was neglected. When concentrate is added to the effluent prior to discharge, the effluent is diluted with concentrate. The composite effluent is then further diluted when it is discharged out the diffuser into the ocean. So, from the standpoint of the dilution of wastewater effluent, actual dilution rates are higher than those reported here by a factor ranging from 1 to 2 depending on the relative amount of effluent flow and concentrate flow.

- During periods of maximum capacity operation and assuming a rejection rate[7] of 0.55, the concentrate flow rate from 2.5, 3.5, and 4.5 mgd facilities are approximately 3.1, 4.3, and 5.0 mgd respectively (Brown and Caldwell 2004).

Hourly flow rates were assumed to vary over the 24-hour period, with peak flow rates occurring around 1:00 p.m. and the lowest flow rates occurring around 5:00 a.m. (Figure 5.1-2). For the calculations, the acceptable concentrate flow rate was set equal to the wastewater effluent flow rate. During the low-flow hours, wastewater effluent flow rates between 1 and 2 mgd are expected. During these times, storage of concentrate effluent would be necessary until additional wastewater is available. During peak-flow hours, flow rates of between 7 and 11 mgd are expected. Excess concentrate stored during the morning hours would be discharged during relatively high late-morning and early-afternoon effluent flow rates.

Figure 5.1-2 Summary of Effluent Flows and Concentrate Storage Requirements



Based on the assumptions and values described above, required storage for the 2.5- and 3.5-mgd desalination facilities are 0.43 and 0.86 million gallons (mg), respectively. Adding a safety factor of around 1.2 yields the recommended storage volumes of 0.5 and 1.0 mg for the 2.5- and 3.5-mgd facilities respectively.

To ensure adequate dilution, stored concentrate would have to be released at a controlled rate. The recommended discharge scenarios for the stored concentrate are summarized in Tables 5.1-7 and 5.1-8.

[7] The rejection rate is the ratio of the amount of water that is wasted as concentrate to the amount of water that is drawn in at the intake structure. A rejection rate of 0.55 implies that 55 percent of water drawn in at the intake structure is released as concentrate while 45 percent of the water becomes product drinking water.

Table 5.1-7
Recommended Rate of Stored Concentrate Discharge for 2.5-mgd Desalination Facility

EFFLUENT FLOW RATE, MGD	RATE OF DISCHARGE OF STORED CONCENTRATE, MGD
<4	0
>4	0.5
>5	1
>6	2
>7	3

Source: Brown and Caldwell 2004

Table 5.1-8
Recommended Rate of Stored Concentrate Discharge for 3.5-mgd Desalination Facility

EFFLUENT FLOW RATE, MGD	RATE OF DISCHARGE OF STORED CONCENTRATE, MGD
<5	0
>5	0.5
>5.5	1
>6.5	2
>7.5	3
>8	4

Source: Brown and Caldwell 2004

Alternative D-1 (Applicable to the First Increment of this Alternative Only)

Under Alternative D-1, the desalination facility would be operated during drought periods only. For the purposes of this report, operation would occur during one out of every six years for six months out of the year. This is a conservative assumption, particularly considering that the City estimates that over the past 59 years, the full desalination plant capacity (2.5 mgd) would have been required on only 4 percent of the days, and partial capacity would have been required on only 10 percent of the days. The majority of these days would have been confined to dry and critically dry years. Operation of the desalination facility is minimal under the first increment of Alternative D-1, and any potential impacts of composite effluent to marine ecosystems would be much lower than under the first increment of Alternative D-2 or the subsequent increments of Alternatives D-1 and D-2.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Under Alternative D-2, the desalination facility would be operated during drought and nondrought periods. In order to meet the needs of the potential partner, the desalination facility would likely be operated at approximately 1.25-mgd capacity, 24 hours a day, 365 days a year. It is assumed that during drought years, or during one out of six years for six months out of the year, the plant would operate at full capacity to meet the needs of the City during a drought. Alternative D-2 would therefore have the same impacts as Alternative D-1 with the additional impact of running the plant at 1.25-mgd throughout the year. This increase in activity would result in a more constant discharge of concentrate throughout the year as well as the potential beneficial impacts of composite discharge occurring throughout the year. The first increment of Alternative D-2 also provides a contingency that the SqCWD may use up to 2.5-mgd for a short period at the onset of operation to restore groundwater levels in the Purisima aquifer. This short-term increase would not increase the maximum daily output of the desalination facility, and does not change the overall finding for this alternative.

Should there ever be insufficient volumes of wastewater for concentrate dilution such that the terms of the NPDES permit would be violated, water production at the desalination plant would be reduced or stopped until all permit requirements could continue to be met.

Alternative D-1 (Applicable to Subsequent Increments of this Alternative Only)
Under the 3.5- and 4.5-mgd future expansion alternatives, it is assumed that full-capacity operation of the desalination facility would occur during one out of every six years for eight months out of the year (March – October), primarily for drought reliability, and that SqCWD would not require additional desalinated water beyond the first increment. Daily concentrate discharge volumes under the 3.5- and 4.5-mgd expansions would increase respectively by almost 40 percent and 80 percent from the first increment of Alternative D-1. During periods of maximum-capacity operation, the concentrate flow rate from the 3.5- and 4.5-mgd desalination facilities would be 4.3- and 5-mgd, respectively (Black and Veatch 2003). Dilution modeling results show that a 3.5-mgd plant could still meet the required 114:1 dilution ratio. Further evaluation would be conducted to determine the appropriate dilution volumes and storage requirements for disposal of concentrate under the 4.5-mgd expansion scenario. In the future, the City may decide to operate the desalination facility at partial capacity (1.25-mgd) to meet year-round water demand. In such a case, the scenario would be similar to that described under the first increment of Alternative D-2, above. The potential beneficial impacts of concentrate dilution would occur throughout the year.

Alternative D-2 (Applicable to Subsequent Increments of this Alternative Only)
Under Alternative D-2 of the subsequent increments scenario, SqCWD would not receive additional water beyond the 1.25 mgd provided under the first increment of Alternative D-2. However, if the City needs to use 1.25 mgd year-round, the total year-round capacity of the desalination facility could reach 2.5-mgd. On a daily basis, operating the facility at this level is not anticipated to cause significant negative impacts and would still meet the 114:1 dilution requirements. Likewise, operating throughout the year would not cause a significant impact and could actually enhance the beneficial effect of diluting the City's wastewater effluent with concentrate.

Mitigation Measures
Mitigation Measure 5.1-2: This mitigation measure applies to the desalination plant component only. Operation of the desalination plant shall occur in conjunction with the City's WWTP to ensure that seawater concentrate discharge mixes with wastewater effluent prior to discharge. The composite discharge shall comply with the requirements of the WWTP's existing NPDES permit (or amended permit, as necessary). The allowable concentrate discharge rate will be controlled through continuous and automatic calculations based on wastewater flow. If concentrate discharge is found to cause violations regarding dilutions (as may occur during a drought), storage and discharges would be timed such that concentrate is only released during periods of adequate wastewater flow. The City shall establish the requirements for concentrate storage volumes as the design of the desalination plant progresses such that NPDES conditions are met.

Equalization basins are proposed as part of the Program. The recommended storage volumes are 0.5 and 1.0 mg for the 2.5-and 3.5-mgd facilities, respectively. The City shall establish exact sizes during the design phase and shall perform calculations to determine the appropriate increase in storage volume required for a 4.5-mgd expansion.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.1-3: Storage, use, and disposal of chemicals at the desalination facility could affect water quality of nearby surface waters, the Pacific Ocean, and the Monterey Bay National Marine Sanctuary. Less than Significant with EIR-Identified Mitigation.**

<u>General Discussion (Applicable to all Increments of both Alternatives)</u>

Operation of the desalination facility would require the storage, use, and disposal of at least six types of chemicals. These chemicals and their specific uses at the facility are listed in Table 4-5 of Chapter 4, Program Description. Handling and storage of chemicals create the risk for chemical spills and subsequent risk to nearby surface waters. Chemical streams would be segregated from the concentrate effluent streams for those chemicals used to clean and store the RO units when they are out of service. The chemical waste stream would go directly to the municipal waste system for treatment at the WWTP. Other chemicals such as chlorine for disinfection, lime (calcium hydroxide), and sodium hydroxide would end up in the product water from the plant. These chemicals are typically used for water treatment at dosages that allow for human consumption.

As described in Section 5.11, Hazards and Hazardous Materials, the City would prepare a Hazardous Materials Management Plan for the management of chemicals used at the desalination plant. The plan would include protocol for chemical transportation, use, spill prevention and cleanup, and disposal.

<u>Alternative D-1 (Applicable to the First Increment of this Alternative Only)</u>

Under Alternative D-1, the desalination facility would use fewer water treatment chemicals than Alternative D-2 because it would operate less frequently. However, the amount of acidic/basic membrane cleaning solution used to preserve the RO membranes when the plant is not in use would be about twice that used under Alternative D-2, as the entire facility would be shut down during normal years (rather than only half of the facility for Alternative D-2).

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Under Alternative D-2, the desalination facility would use greater volumes of water treatment chemical inputs, with the exception of the membrane cleaning solution. In fact, the total volume of water treated over a six-year period would be six and a half times greater than the volume treated under Alternative D-1. Impacts associated with transportation, storage, and disposal would therefore be greater.

Alternative D-1 (Applicable to Subsequent Increments of this Alternative Only)

Chemical use under the 3.5- and 4.5-mgd expansions would increase by around 40 percent and 80 percent, respectively, from the first increment of Alternative D-1, as more water would be treated and additional RO membranes would require upkeep, maintenance, and storage. Should the City utilize 1.25 mgd throughout the year, chemical use would be similar to that described for the first increment of Alternative D-2, with the added impact of increased chemical use during drought periods. The total volume of water treated for the 3.5- and 4.5-mgd expansions over a six-year period would be slightly over 7 times and nearly 8 times greater than the volume treated under the first increment of Alternative D-1. Impacts associated with transportation, storage and disposal of chemicals would therefore be significantly greater.

Alternative D-2 (Applicable to the Subsequent Increments of this Alternative Only)

Impacts of Alternative D-2 under the subsequent increments scenario would be similar to those described for the first increment of Alternative D-2, with the added impact of 40 to 80 percent more chemicals used during drought periods (one out of six years, eight months out of the year). The net result is a total increase in water treatment chemical use of slightly over 7 times and nearly eight times for the 3.5- and 4.5-mgd expansions. However, in addition to year-round use by SqCWD, the City may decide to use 1.25 mgd year-round to meet its own future demand, increasing the total year-round use to 2.5 mgd. The total volume of water treated over a six-year period would be twelve and one-half times and 13 times greater than the volume treated under the first increment of Alternative D-1. Impacts associated with transportation, storage, and disposal of chemicals would therefore be far greater than under the first increment of Alternative D-1.

Mitigation Measures

Refer to Section 5.11, Hazards and Hazardous Materials, for a discussion of the Hazardous Materials Management Plan.

Mitigation Measure 5.1-3: This mitigation measure applies to the desalination plant component only. The desalination facility shall be designed such that cleaning solution chemicals are not disposed of in combination with the concentrate waste stream. Rather, chemical waste streams shall be segregated from concentrate waste streams and conveyed to the WWTP for treatment prior to discharge.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.1-4: The Proposed Program could place structures in flooding hazard zones, thereby exposing people and structures to the risk of injury or loss, or could alter drainage and runoff characteristics such that downstream flood hazards would be increased. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to all Increments of both Alternatives)

Program components that occur in 100-year floodplains or are subject to flooding hazard by tides, waves, tsunamis, or seiches are evaluated for this potential impact. During construction, these proposed-Program facilities could be damaged during 100-year storm events or other natural hydrologic hazards. Any structures placed in floodways could alter flooding patterns and create flooding hazards. Site-specific impacts are discussed below.

In addition, the new desalination facilities would place impermeable surfaces on land that that is bare ground under existing conditions. This would change runoff characteristics from the properties and could potentially cause increases in flooding hazards downstream. This is considered a less than significant impact due to the sufficient existing capacity of stormwater runoff systems including channels and culverts in the vicinity of the project. In addition, Mitigation Measure 5.1-5 would further reduce the volume and rate of stormwater runoff from the site.

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant. A small section on the east side of the Shaffer Road/Antonelli's Pond Area is within the Moore Creek 100-year floodplain. This section would be avoided during site layout to prevent any potential flooding hazards. Section 24.14.080 of the City's zoning ordinance prohibits construction of main or accessory structures, grading, or removal of vegetation within 100 feet from the center watercourse of riparian areas. A riparian buffer setback from Moore Creek is suggested under the *Moore Creek Management Plan* in the City's General Plan. Compliance with the setback requirements would achieve avoidance of the 100-year floodplain section of the Shaffer Road/Antonelli's Pond Area.

There are no designated 100-year floodplains in the Industrial Park Area or the Terrace Point Area.

Conveyance and Pumping Facilities

Conveyance Facilities. Segments of conveyance pipelines could be damaged by wash-out where they cross the 100-year floodplains of rivers and creeks. To avoid such impacts, all pipelines would either be buried below the scour depth of the drainage or elevated above the floodplain. All of the D-1 conveyance pipelines are subject to this potential impact where they cross Moore Creek. However, the pipelines are likely to be trenched beneath the road, which is elevated above the creek, and are not likely to suffer damage during a 100-year storm. None of the other creeks in the D-1 study area are large enough to cause significant risk of wash-out to pipelines.

Raw Water Intake Pumping Facility. The pumping facility may be located in an area along the coastline that is exposed to severe wave action from storm waves, tsunamis, and seiche waves, and to flooding by tides. The facility would be built to current applicable safety standards. Construction and maintenance crews would be informed of safety issues regarding the facilities' proximity to the ocean and would not be required to work in and around the facility during hazardous conditions. Construction of the pumping facility would take place during the summer, when there is a low probability of large, storm-generated waves.

All of the impacts discussed above under Conveyance Pipelines are valid for the raw water pipeline, which is part of the raw water intake system.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipeline (Corridors 5, 6, and 7) and Pumping Facility. In addition to the facilities described above, Alternative D-2 would also include distribution pipelines and a pumping facility. The Alternative D-2 pipelines would be subject to potential wash-out where they cross the Arana Gulch and Rodeo Gulch. To avoid potential damage to the pumping facility, it would be sited away from a 100-year floodplain or designed to withstand 100-year floods.

Alternatives D-1 and D-2 (Applicable to Subsequent Increments (3.5- and 4.5-mgd Expansions) of both Alternatives)

The impacts associated with the potential future expansion of the desalination facility are the same as those discussed above.

Mitigation Measures

Mitigation Measure 5.1-4a: This mitigation measure applies to the raw water intake pumping facility component only. The pumping facility, if constructed as a separate structure outside of the existing junction structure, shall be designed to current applicable safety standards.

Mitigation Measure 5.1-4b: This mitigation measure applies to the raw water intake pumping facility component only. To prevent risk to construction workers, construction activities for the proposed pump facility at the beach occurring below the mean high-tide elevation shall be conducted during low-tide periods.

Mitigation Measure 5.1-4c: This mitigation measure applies to the Alternative D-2 pumping facility component only. If placed within a 100-year floodplain, the D-2 pumping facility shall be designed to withstand a 100-year flood.

Mitigation Measure 5.1-4d: This mitigation measure applies to the desalination plant component if it is sited at the Shaffer Road/Antonelli’s Pond area only. Any construction occurring at the Shaffer Road/ Antonelli’s Pond Area shall require a setback from Moore Creek to avoid the 100-year floodplain of Moore Creek.

Mitigation Measure 5.1-4e: This mitigation measure applies to the pipeline alignments only. Where pipelines would cross creeks, they would be buried below the scour depth to ensure that wash-out of the pipelines would not occur.

Significance After Mitigation: Less than Significant.

Impact 5.1-5: The Proposed Program could impact the water quality of nearby surface waters through stormwater runoff from developed impermeable surfaces and landscape applications. Less than Significant.

Alternatives D-1 and D-2 (Applicable to the First and Subsequent Increments of both Alternatives)

Desalination Plant. Conversion of bare, open ground to impermeable surfaces at the proposed desalination facility areas would increase runoff volumes and pollutants entering local waterways. The water quality of surface runoff is directly correlated to land use. Paved and impermeable surfaces including roofs, parking lots, and sidewalks accumulate pollutants which are carried in stormwater runoff to nearby surface waters during rain events. Parking lots in particular accumulate petroleum products, heavy metals (copper, nickel, selenium) and other chemicals associated with vehicle operation. Impermeable surfaces also accumulate particulate matter and other pollutants (furans, dioxins, mercury) due to dry deposition. The use of pesticides and fertilizers on landscaping at the desalination facility could cause water quality degradation. Concentrations of pollutants running off of the site would be low enough to meet water quality goals of the Regional Water Quality Control Board. In addition, because none of the water bodies in the vicinity of the potential desalination areas are listed on the California 303(d) list incremental increases in pollutant load from the desalination areas would not constitute a significant impact. Therefore, the Program’s impact to the water quality of surface waters is less than significant. However, to further reduce the deterioration of surface water quality it is recommended that the Program incorporate the following recommendations

Recommended Measure 5.1-1: Low Impact Design

The desalination facility should be constructed using principles of low impact design to reduce scouring flows in receiving water bodies, and reduce nutrient, metal, and other pollutant loads entering those water bodies. The LID components would also serve to reduce flood volumes and rates and would help to ensure that runoff from the desalination site is not increased due to implementation of the Program. Features to be included in the design of the desalination facility include.

- grassy swales, or vegetated filter strips alongside sidewalks, and parking lots;
- pervious pavement and asphalt in parking lots, driveways, sidewalks, and other hard outdoor surfaces (a number of varieties are available). Necessary impervious surfaces should be disconnected from other impervious surfaces by open ground areas for infiltration;
- depressed curbs in parking lots to allow water to run directly to swales and other LID features.

Combinations of low impact design strategies have been shown to reduce loading of heavy metals by 30 to 98%, oils and grease by up to 95%, TSS by up to 90%, TP by up to 87%, and TN by up to 80% (USEPA 2000). In addition, properly designed, these features cost less than conventional stormwater management systems to construct and maintain, in part, because of fewer pipes, fewer below-ground infrastructure requirements, and less imperviousness. Other benefits of the LID features include increased groundwater recharge, greater marketability, improved wildlife habitat, thermal pollution reduction, and improved public perception of the Project.

Significance After Mitigation: Less than significant

⌧ **Impact 5.1-6: The Proposed Program could affect local and regional groundwater supply by reducing the net storage of the aquifer, causing well interference, depleting surface water flows, causing seawater intrusion, or inducing ground subsidence.**

Significant but mitigable for Alternative D-1 Only (seawater intrusion). Less than Significant for all other impacts.

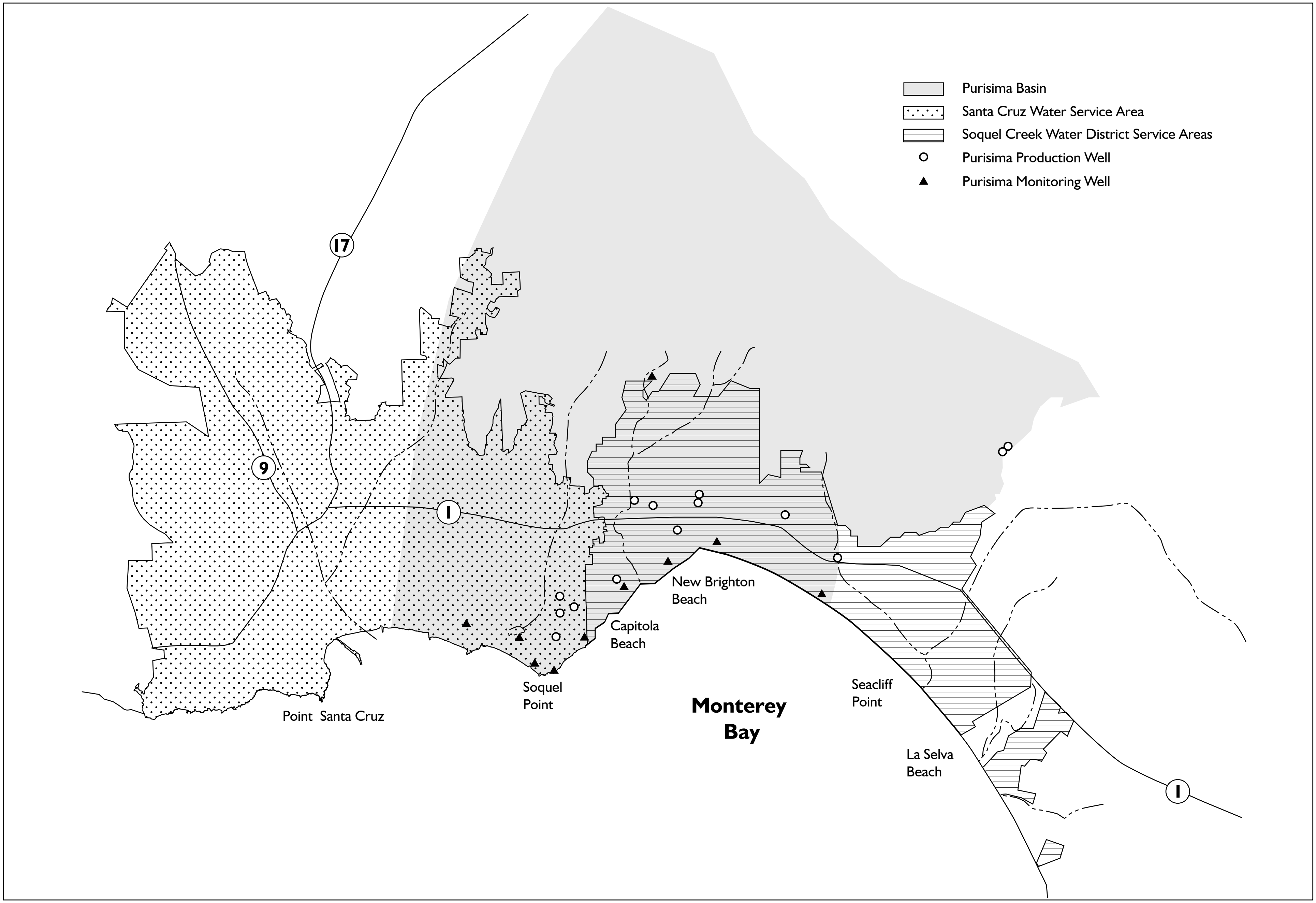
General Discussion

Groundwater resources within Santa Cruz County constitute a vital shared source of water supply for cities and communities. Some of the cities and communities depend almost wholly on groundwater resources. Thus, the impact of any intensified use of groundwater or the gradual increase of groundwater over many years that exceeds safe yield is of particular concern.

Groundwater from the Purisima Formation is used for the City, SqCWD, the Central Water District and other private wells (Figure 5.1-3). The Purisima Formation is composed of multiple interbedded coarse- and fine-grained layers that form a confined/leaky-confined bedrock aquifer interbedded with sandy silt and sand clay strata that serve as confining layers. Current, total annual extraction from the Purisima aquifer by all pumpers is approximately 1,970 mgy (6,045 afy). Of this rate, the City currently produces about 167 mgy (513 afy), SqCWD produces approximately 1,075 mgy (3,299 afy), and private well production is estimated at about 728 mgy (2,234 afy) (Johnson et al. 2004).

The entire production of the city's Live Oak well field is derived from the aquifer subunits of the Purisima Formation designated A and AA (Hopkins Groundwater Consultants, Inc. 2004) and accounts for about 5 percent of the City's water supply. This well field has been a vital component of the City's water supply system since its acquisition from the Beltz Water Company in 1964. The Beltz Treatment Plant was expanded from its original capacity of 1 mgd to 2 mgd in 1986. Well damage sustained in the 1989 Loma Prieta earthquake reduced well capacity to 1 mgd. Well capacity was restored to 2 mgd in 2000 and a project is planned to restore treatment capacity to a reliable amount of 2 mgd in 2007

Historically, the City has operated the Live Oak well field in response to widely fluctuating hydrologic conditions with periods of little production during extremely wet years and periods of higher production during periods of drought (Table 5.1-9). Specifically, it has operated its wells during a period of 150 to 200 days out of the year at a combined operational rate of about 1 mgd on average. During the extended drought of 1987-1988, operation averaged 423 mgy (1300 afy), or a combined operational rate of 2 mgd. In 1979, the City pumped as little as 9 mgy (27 afy).



Source: Soquel Creek Water District, 2004; Luhdorff & Scalmanini, 1997

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FIGURE 5.1-3
Purisima Basin

Table 5.1-9
City of Santa Cruz Annual Groundwater Production
(Beltz Wells, Purisima)

CALENDAR YEAR	WELL PRODUCTION (AFY)	WELL PRODUCTION (MGY)	CALENDAR YEAR	WELL PRODUCTION (AFY)	WELL PRODUCTION (MGY)
1972	817	266.24	**1988**	1319	429.77
1973	660	214.92	**1989**	916	298.60
1974	420	136.88	**1990**	698	227.44
1975	378	123.11	**1991**	549	178.74
1976	763	248.72	**1992**	811	264.40
1977	148	48.15	**1993**	416	135.46
1978	262	85.50	**1994**	519	169.07
1979	26	8.47	**1995**	276	90.00
1980	105	34.24	**1996**	168	54.70
1981	462	150.50	**1997**	245	79.90
1982	235	76.62	**1998**	306	99.56
1983	309	100.53	**1999**	284	92.44
1984	446	145.32	**2000**	574	187.00
1985	536	174.66	**2001**	526	171.35
1986	103	33.58	**2002**	546	177.88
1987	1196	389.61	**2003**	407	132.5
			Maximum	1319	429.77
			Minimum	26	8.47
			32-year average (1972-2003)	482	157.06
			17-year average (1986-2003)	574	186.97
			4-year average (2000-2003)	513	167.18

Available data indicate that the groundwater elevations near the Live Oak coastline likely fluctuate between levels at or below sea level to several feet above sea level. Groundwater level data from 1987-2002 indicate a downward trend, and suggest that SqCWD's well placement strategy of relocating wells and concentrating groundwater production along the western portion of its service district has likely impaired the City's ability to maintain production and favorable coastal groundwater conditions (Hopkins Groundwater Consultants, Inc. 2004). Groundwater levels have declined in the western part of the District, but have remained relatively constant elsewhere.

As indicated in the IWP, the future operation of the Live Oak well field is consistent with historical use with the basis of operation at approximately 1 mgd during the summer of an average year and operation at 2 mgd only during a drought or critically dry year when surface water supplies fall short. Groundwater production from the City's wells would be the same under the No Project, D-1, and D-2 alternatives. The City's 17-year (from 1986 to 2003) average groundwater extraction rate from the Live Oak wells was approximately 187 mgy (574 afy), slightly higher than the groundwater production over the last four years of 167 mgy (513 afy). This 17-year period includes critically dry, dry, normal, and wet years, and is therefore representative of the long-term future extraction rates from the Live Oak wells. Under future operation of the Live Oak wells, water could be pumped at a rate of up to 2 mgd for up to 200 days per year during a drought, for a total production of up to 400 mgy (1227 afy). During normal and wet years, the Live Oak wells could pump at much lower rates similar to the most recent four-year average of 167 mgy.

For the purposes of this document, baseline production is represented by the average annual groundwater extraction rate over the last four years 2000 – 2003, since the City successfully replaced two wells damaged in the 1989 Loma Prieta earthquake (Beltz Well Nos. 8 and 9). The four-year average of 167 million gallons per year mgy (513 afy) has not included any critically dry, dry years or drought periods and thus represents a pumping rate which is slightly below the long term average and one that would be conducted in a normal to slightly wet period.

Groundwater overdraft impacts are evaluated in terms of the difference between the baseline production over the last four years of 167 mgy, and the projected future operation which is anticipated to be, on average, around 187 mgy (the baseline production over the last 17 years).

Well interference, surface water, and seawater intrusion impacts are evaluated using a different method based on the maximum drought event extraction rate of 2 mgd for 200 consecutive days. While the average annual extraction rate is used to predict groundwater overdraft impacts over long timescales (decadal), the maximum extraction rate and duration is used to predict the area potentially influenced by Live Oak Well Field at the end of a single extraction season and is thus used to predict well interference, surface water, and seawater intrusion impacts.

The potential of groundwater withdrawal to cause ground subsidence is assessed by evaluating the sediment composition of the Purisima, and whether it is loose and unconsolidated or consolidated; any observed or reported subsidence in the past; and the magnitude of groundwater withdrawal.

<u>Alternatives D-1 and D-2 (Applicable to the First and Subsequent Increments of both Alternatives)</u>

Groundwater Overdraft

Water levels in the coastal aquifer zones are indicative of the amount of groundwater stored inland and moving down through the aquifer system. The water level at any given location is a balance of the local and regional dynamics of recharge to, and extraction or outflow from, the aquifer. Groundwater level data collected over the past 15 years indicate that water levels across the Purisima basin have been lowered by changes in pumping patterns and the gradual increase in overall groundwater production from the aquifer.

For all of the alternatives contemplated in the IWP and evaluated in this EIR (i.e., No Project and the first and subsequent increments of D-1 and D-2), the City anticipates that it will produce groundwater from the Purisima aquifer system in a manner consistent with historical production. The future annual average of approximately 187 mg is consistent with its 17-year baseline production rate, which included a period of higher than normal demand due to the extended drought of 1987-1988, and is 20 mgy (or 12 percent) more than the City's short-term baseline production rate (the four year period from 2000 to 2003, when hydrologic conditions were wet to normal and demands close to current levels).[8] Relative to the total average annual pumping from the Purisima Formation

[8] The City supplies the Live Oak area with water from the Purisima as well as water imported from the San Lorenzo River and north county stream diversions.

by all pumpers (i.e., City of Santa Cruz, Soquel Creek Water District, and the Central Water District over the period from the early/mid 1960s to 2002; pumping from private wells is unrecorded) of over 1200 mgy (3,700 afy), this is an increase of approximately 1.5%.

The anticipated increase of 20 mgy is low when considering the large variability in hydrologic conditions which affect pumping rates and total pumping in the aquifer. Therefore, the D-1 alternative would not contribute to additional groundwater overdraft and is considered to have a less-than-significant impact on groundwater storage within the basin.

Under Alternative D-2, delivery of desalination water to SqCWD during normal and wet years would allow reduced pumping in that district and would more than compensate for the small anticipated increase in pumping by the City. Considering the benefit of reducing groundwater pumping in SqCWD (D-2 only)[9], the D-2 alternative would contribute to additional groundwater in storage and is considered to have a beneficial impact on the groundwater basin.

Well Interference

Well interference impacts were estimated using cumulative production of the Live Oak well field and calculating distance-drawdown values at the end of 200 days of continuous operation at both 1 mgd and 2 mgd. Drawdown estimates were made using a two-dimensional analysis provided by the aquifer test solution software AQTESOLV™. A conservative transmissivity value was chosen, and thus the drawdown calculated is slightly overestimated. The results were correlated with historical extraction and observed groundwater level changes for verification. Operation of the Live Oak well field over the last 32 years has not significantly affected proximate wells of existing groundwater users. Calculations indicate that at a distance of 2,000 feet from the well field, a drawdown effect of up to three feet under 1 mgd operation and up to six feet during 2 mgd operation could occur in the aquifer. The calculated drawdown values at the nearest SqCWD well are on the order of 1 to 2 feet under all proposed pumping conditions. Because these levels of interference drawdown are periodic, infrequent, and have been historically tolerable, the impact is considered less than significant for all IWP alternatives.

Stream Flow and Surface Water Depletion

Flow paths of water through the Purisima Formation include movement of groundwater from one aquifer subunit to another (vertical seepage), discharge of groundwater to streams (base flow), and discharge of groundwater to the ocean through offshore outcrop areas (off shore discharge).

The magnitude of effect that groundwater withdrawal has on a surface water body is variable and influenced by factors that include the local geology and hydrogeology, the proximity of the withdrawal to the surface water body, and the amount of groundwater extracted. For example, deep wells constructed in less permeable bedrock units typically have less of a direct impact on surface waters than shallow alluvial wells. Deeper coastal wells can derive a greater amount of production from groundwater that would have contributed to offshore discharge and, as such, wells along the coastline typically do not have a significant potential to decrease stream base flows inland.

[9] The D-2 analysis is based on the assumption that SqCWD has no other options for supplemental water supply.

Coastal lagoons and estuaries in the Live Oak area derive a majority of their water from stream inflow and occasionally from the ocean under high-tide conditions. Moreover, the hydraulic connection between groundwater and coastal estuaries and lagoons is restricted by the generally low hydraulic conductivity values of lagoon and estuary sediments, which effectively seal the bottom of the water bodies and impede vertical leakage.

The City's well field is a considerable distance (1,500 feet or greater) from most sensitive surface water features (including Soquel Creek). The primary component of groundwater produced from the City wells is offshore flow that would otherwise emerge as a subsurface discharge to the ocean.

A study was conducted by the City (Hopkins 2004) to estimate the drawdown from the City well field at the nearest point to the various surface water bodies. Drawdown depths in the aquifer beneath each water body from well field operation, and distances to the well are provided in Table 5.1-10.

Table 5.1-10
Estimated Purisima Aquifer Drawdown
From Live Oak Well Field Production

CLOSEST WATER BODY	AVERAGE DISTANCE TO CITY WELL FIELD (FEET)	PURISIMA A & AA-ZONE DRAWDOWN 1MGD (FEET)	A & AA-PURISIMAZONE DRAWDOWN 2MGD (FEET)
Soquel Creek	5,870	0.1	0.2
Moran Lake	2770	1.7	3.5
Corcoran Lagoon	2370	2	4
Schwann Lake	6000	0.1	0.2
Rodeo Creek	1570	3.2	6.5
Arana Gulch Creek	8630	0	0
Ocean Outcrop	3670	1.2	2.4

Distance and drawdown estimates are at the closest point of the water body listed
Drawdown indicated is at the end of 200 days of continuous operation at 2 mgd
Source: Hopkins Groundwater Consultants Inc. 2004; Johnson et al 2004

Studies conducted to specifically determine the aquifer/stream flow interaction along the lower reaches of Soquel Creek indicate that losing and gaining stream flow reaches exist. However, the studies are inconclusive regarding the impact of groundwater extraction on stream flow (LKA/L&S 2003; Johnson et al. 2004). Test data obtained from pumping the SqCWD Main Street well indicated the lack of influence on Soquel Creek which was located at a distance of 195 feet from the well (Luhdorff and Scalmanini 1991; Todd 2001).

The values presented in Table 5.1-10 are representative of the final drawdown that would occur at the end of 200 days of continuous pumping at rates of both 1 and 2 mgd. The drawdown amounts in the aquifer do not directly translate to reductions in stream flow. Although SqCWD produces an average of over 228 mgy (700 afy) from the Main Street well which results in the 10 to 15 feet of drawdown beneath Soquel Creek located at a distance of 195 feet, the chronic depletion of base flow is estimated at less than 0.5 cfs (Johnson et al. 2004).

Several of the water bodies are not directly connected to the A and AA-Zones of the Purisima aquifer produced by the City wells. Those water bodies that are connected, such as Rodeo Creek, have limited streambed exposure within the well field's radius of influence. Leakage along this stream reach is controlled by the streambed infiltration rate allowed by the fine-grained sediment and biological growth that blankets the channel. Historical well operations have not been documented to cause an effect on this stream. In addition, the maximum drawdown values modeled in the groundwater study would only occur intermittently during the most severe droughts and are significantly less than those induced by pumping at the highly studied Main Street well. Given the state of understanding of the historical natural conditions, production under all Program alternatives would have a less-than-significant impact on surface waters, including coastal lagoons and estuaries.

Ground Subsidence

Groundwater extraction from loose, unconsolidated, fine-grained sediment can result in ground surface subsidence. The potential for subsidence in the consolidated Purisima Formation is considered very low. The Purisima sediments were compressed through burial prior to the tectonic uplift, which has placed the formation at its present elevation. In addition, historical pumping has not caused any observed or reported subsidence in the area near the Live Oak field. The subsurface materials in the Live Oak area have already been subjected to low water level conditions and thus, had these materials been susceptible to it, further consolidation would have already occurred. Because the magnitude of drawdown caused by the City pumping is small, and the Purisima Formation is consolidated, the impact from the City well operation under all IWP alternatives is less than significant.

<u>Alternative D-1 (Applicable to the First and Subsequent Increments of this Alternative)</u>

Seawater Intrusion

The Live Oak well field's coastal location makes it the closest area of groundwater extraction to the offshore outcrop of the A and AA subunits of the Purisima Formation. While pumping at the City facilities constitutes a relatively small component of the total groundwater basin extractions, the City is the last pumper to capture groundwater that would otherwise become offshore flow through the ocean floor outcrop.

Basin water level conditions that have developed since the last drought period (1987-1988) indicate that the City's ability to produce at the historical rate of 2 mgd during a drought might be precluded by conditions that have developed from the increased annual demand by other pumpers in the basin since that time. In the future, if pumping by all users continues at present rates, then the City's use of the Live Oak wells at 2 mgd (during drought conditions) could exacerbate this condition and result in potentially significant impacts.

Measurements at the Pleasure Point monitoring well (which monitors zones A and AA of the aquifer) following the 1987 and 1988 production period indicate that water levels along the coast dropped near or below sea level. Following the drought, water levels then recovered to nearly 20 feet msl (Johnson et al. 2004).

Pumping throughout the basin has shown a progressive increase since the 1960s. For example, pumping by SqCWD has increased from approximately 1400 afy in 1966 to 3,400 afy in 2002 while the Central Water District's pumping has increased from 140 afy in 1965 to nearly 600 afy in 2002 (Johnson et al. 2004). For SqCWD, unless an alternate water supply is provided (either through desalination or other options), pumping at these rates is likely to continue. The City's pumping has fluctuated widely during the period from 1962 to 2002 from a low of 26 afy to a high of 1,319 afy in 1988 (in response to the extended drought of 1987-1992). As mentioned earlier in this section, the City's future anticipated production from the Purisima will be approximately 187 mgy, which is slightly higher than the 32-year average of 157 mgy (1972-2003).

Given the Purisima Formation's current condition as based on water levels in the coast monitoring wells, the physical position of the City's wells as the last ones to capture groundwater that would otherwise have become offshore flow, and the anticipated continuation of increased annual demand, it is likely that groundwater extraction of up to 2mgd during drought periods will lead to conditions conducive to seawater intrusion and would be a significant and unavoidable impact. Mitigation Measure 5.1-6a will provide data to indicate whether the conditions for seawater intrusion are developing and will be used to facilitate the City's decision-making process for short- and long-term actions to take to reduce the potential for seawater intrusion as well as determine if further mitigation measures are necessary.

During normal and wet years, however, the City's groundwater use (approximately 1 mgd) would not create a significant threat of seawater intrusion.

<u>Alternative D-2 (Applicable to the First and Subsequent Increment of this Alternative)</u>

This alternative offers the greatest potential benefit to the groundwater basin by providing a supplemental supply to each major groundwater user, which could in turn prevent the need to increase future use of the limited groundwater resources.

Seawater Intrusion

Alternative D-2 provides a means for SqCWD to reduce its pumping and reverse the groundwater overdraft trend, particularly during drought periods. This measure could restore coastal water levels in the Live Oak area and could allow historical well production by the City without inducing seawater intrusion. The impact of seawater intrusion is therefore considered less than significant under Alternative D-2.

Mitigation Measure 5.1-6a: This mitigation measure applies to Alternative D-1 only. The City shall utilize and evaluate data from its existing (and recently expanded) coastal monitoring well network as an early-warning system to detect conditions that might develop into a potential for sea water intrusion. If such conditions are evident, the data would be used to determine when curtailment of pumping may be necessary and/or when to shift groundwater demand to other locations within the basin.

Table 5.1-11
Summary of Groundwater Impacts

POTENTIAL IMPACT	NO PROJECT ALTERNATIVE	ALTERNATIVE D-1	ALTERNATIVE D-2
Aquifer Overdraft	Less Than Significant	Less Than Significant	Potential Benefit
Well Interference	Less Than Significant	Less Than Significant	Less Than Significant
Stream Flow Depletion	Less Than Significant	Less Than Significant	Less Than Significant
Seawater Intrusion	Potentially Significant	Significant but mitigable	Less Than Significant
Subsidence	Less Than Significant	Less Than Significant	Less Than Significant

For example, the City could relocate Beltz Well 4 farther inland to allow cessation or reduction of pumping from a well closer to the shoreline, such as Beltz Well 9. This would locally decrease the groundwater gradient near the shoreline and could allow for sustained pumping under drought conditions (2 mgd). Regional transfers of groundwater extraction could also occur in cooperation with SqCWD and its service area. This will reduce overdraft of the A and AA zones of the Purisima aquifer because additional, isolated aquifer zones (B and C zones) which do not occur beneath the City's water district's service area are present beneath the SqCWD service area.

Mitigation Measure 5.1-6b: Should the conditions conducive to seawater intrusion be detected, the City, in coordination with SqCWD, shall develop a plan to redistribute City and SqCWD pumping further inland (or away from the affected area) and to other aquifer zones. This plan could include additional water curtailment above and beyond the amount proposed in the IWP.

Mitigation Measure 5.1-6c: Should the conditions conducive to seawater intrusion be detected, the City shall undertake any of the following measures to reduce the impacts of seawater intrusion and localized groundwater depletion on a short-term basis: temporarily modify pumping patterns, reduce pumping, or cease pumping as necessary to improve the conditions that might otherwise develop into a potential for seawater intrusion.

Significance After Mitigation: Less than Significant.

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5.2 MARINE RESOURCES

5.2.1 Introduction

The intake of seawater and discharge of concentrate from the proposed desalination facility would occur via two existing pipelines located in nearshore ocean waters between Terrace Point and Santa Cruz Point. This section describes existing marine resources in the study area and its immediate surroundings, as well as relevant policies and regulations that relate to marine resources. In addition, this section presents an evaluation of the potential marine resources impacts that would result from proposed Program implementation.

The description of marine resources in the study area vicinity (Monterey Bay National Marine Sanctuary) is based primarily on information in the *Monterey Bay National Marine Sanctuary Site Characterization* report (MBNMS Project Staff 1996). Information on marine resources in the study area was derived primarily from *Oceanographic Predesign Phase Report, Santa Cruz Wastewater Facilities Planning Study* (Brown and Caldwell 1978) and *Historical Review of Ocean Outfall Monitoring Program and Effects of Discharge on Marine Environment* (Kinnetic Laboratories, Inc. 1999). Both documents reported the results of marine field surveys in the study area. Because there were no documents that specifically surveyed intertidal resources in the study area, information on the intertidal area at nearby Terrace Point provided in *DEIR Santa Cruz Coastal Marine Research Center at Terrace Point* (Strelow Consulting 1997) was used. It was assumed that rocky intertidal communities in the immediate vicinity of the proposed outfall and intake would be similar to those in the intertidal area off Terrace Point, approximately one-half mile to the west of the study area.

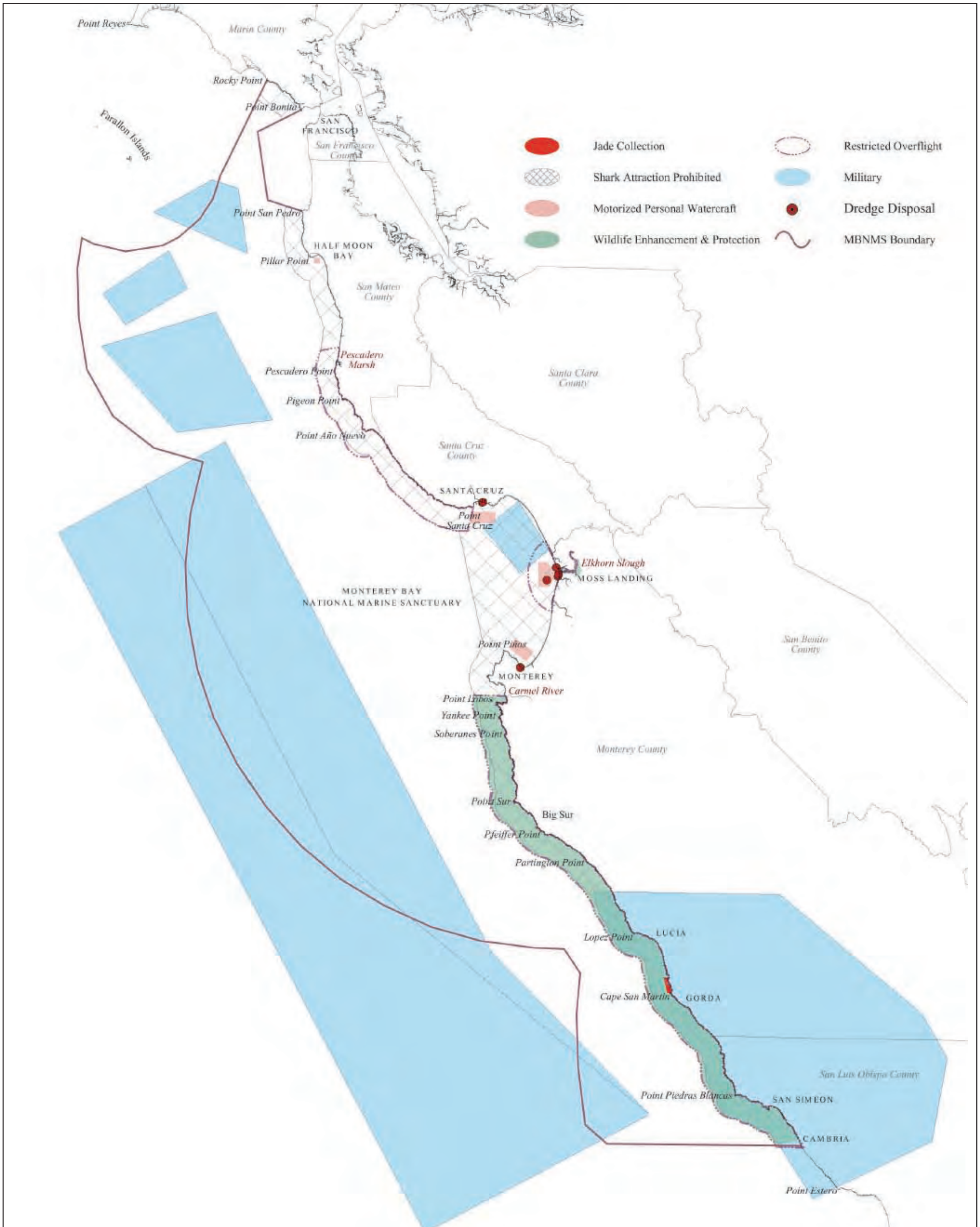
5.2.2 Existing Conditions

Regional Setting

Marine Habitats

The study area lies within the boundaries of Monterey Bay National Marine Sanctuary (the Sanctuary), which is shown on Figure 5.2-1. Monterey Bay was designated as a national marine sanctuary in 1992 to preserve the rich and relatively pristine waters off the central California coast. The Sanctuary, which includes ocean waters from Cambria to north of San Francisco, extends seaward to an average of 30 miles and encompasses 5,322 square miles. The Sanctuary is the largest marine sanctuary in the United States.

Due to its combination of oceanographic and geologic attributes, the Sanctuary supports some of the most diverse assemblages of marine organisms in the world (MBNMS Project Staff 1996). The Sanctuary’s most unique feature is Monterey Submarine Canyon, the deepest and largest submarine canyon off the coast of North America. This canyon, which brings deep water close to shore in the approximate center of Monterey Bay, attracts a wide range of fishes, seabirds, and marine mammals, many of which are oceanic species rarely found in coastal waters. The nutrient-rich upwelling in the Sanctuary nourishes an aquatic environment that is unusually diverse in species and habitat types within a relatively confined area. The biological diversity within the Sanctuary is also due to its location in the transition zone between warm and cold water biological assemblages, and thus the Sanctuary



Source: MBNMS 2001

FIGURE 5.2-1

Marine Zones in the Monterey Bay National Marine Sactuary

supports both warm- and cold-water species. The nutrient-rich waters of the Sanctuary support extensive fish, invertebrate, seabird, and marine mammal populations as well as commercial fisheries.

Significant areas of rocky intertidal and subtidal habitat as well as large kelp beds occur at the northern and southern ends of Monterey Bay. Rocky shoreline constitutes 56 percent of the Sanctuary’s coastline (De Vogelaere 1996). Subtidal reefs and kelp beds are especially rich in marine life. The central portion of Monterey Bay contains sandy beaches and soft-bottom subtidal habitat. Monterey Submarine Canyon, with its head near Moss Landing, bisects Monterey Bay. Elkhorn Slough near Moss Landing is one of the few relatively undisturbed coastal wetlands remaining in California. Elkhorn Slough supports nearly 260 species of birds and is an important link in the Pacific Flyway. The Sanctuary as a whole supports large numbers of seabirds year-round and a diversity of marine mammals. At least 94 species of seabird and 26 species of marine mammals have been observed within the Sanctuary.

Listed Marine Species

The marine waters of the Sanctuary support a number of listed animal species (Table 5.2-1). Listed animals are species that are designated as either Threatened or Endangered by the federal government and/or the State of California and are afforded legal protection. Six species of whale listed as Federal Endangered occur within the Sanctuary: the blue whale (*Balaenoptera musculus*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), sperm whale (*Physeter macrocephalus*), right whale (*Eubalaena glacialis*), and sei whale (*Balenoptera borealis*). Two listed pinnipeds occur in the Sanctuary: the Federal and State Threatened Guadalupe fur seal (*Arctocephalus townsendi*) and the Federal Threatened Steller sea lion (*Eumetopias jubatus*). The southern sea otter (*Enhydra lutris nereis*), a Federal Threatened species, occurs within the Sanctuary. The highest concentrations of the sea otter are around Santa Cruz, the mouth of Elkhorn Slough, and in the kelp beds at the southern end of Monterey Bay.

Listed marine bird species in the Sanctuary include the State and Federal Endangered California brown pelican (*Pelecanus occidentalis californicus*), which disperses to the Monterey area from its breeding colonies on southern California and Mexican islands; the State and Federal Endangered California least tern (*Sterna antillarum browni*), which does not nest in Monterey Bay; the Federal Threatened western snowy plover (*Charadrius alexandrinus nivosus*), a sand beach shorebird that nests within the Sanctuary; and the State Endangered, Federal Threatened marbled murrelet (*Brachyrampus marmoratus*). Marbled murrelets nest on the branches of old-growth coniferous trees from the coast up to 60 miles inland in forested areas adjacent to the northern portion of the Sanctuary from Santa Cruz north (Carter et al. 1992).

The Federal Threatened steelhead trout (*Oncorhynchus mykiss*) breeds in local streams that drain into the Sanctuary. Other listed salmonids that occur in Sanctuary waters but do not breed in streams within the Sanctuary include Chinook salmon (*Oncorhynchus tshawytscha*) (the winter-run salmon is State and Federal Endangered, the spring-run salmon is State and Federal Threatened), and the Federal Threatened coho salmon (*Oncorhnchus kisutch*).

Four species of sea turtle may occur within the Sanctuary: the Federal Threatened green sea turtle (*Chelonia mydas*), the Federal Threatened Pacific Ridley sea turtle (*Lepidochelys olivacea*), the Federal Threatened loggerhead sea turtle (*Caretta caretta*), and the Federal Endangered leatherback sea turtle (*Lepidochelys olivacea*).

Table 5.2-1
Listed Marine Species of Monterey Bay National Marine Sanctuary

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS
CETACEANS			
Blue Whale	*Balaenoptera musculus*	Endangered	NL
Humpback whale	*Megaptera novaeangliae*	Endangered	NL
Fin whale	*Balaenoptera physalus*	Endangered	NL
Sperm whale	*Physeter macrocephalus*	Endangered	NL
Right whale	*Eubalaena glacialis*	Endangered	NL
Sei whale	*Balenoptera borealis*	Endangered	NL
PINNIPEDS			
Guadalupe fur seal	*Arctocephalus townsendi*	Threatened	Threatened
Steller sea lion	*Eumetopias jubatus*	Threatened	NL
FISSIPEDS			
Southern sea otter	*Enhydra lutris nereis*	Threatened	NL
BIRDS			
California brown pelican	*Pelecanus occidentalis californicus*	Endangered	Endangered
California least tern	*Sterna antillarum browni*	Endangered	Endangered
Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened	NL
Marbled murrelet	*Brachyrampus mammoratus*	Threatened	Endangered
FISHES			
Chinook salmon	*Oncorhynchus tshawtscha*		
Winter run		Endangered	Endangered
Spring run		Threatened	Threatened
Coho salmon	*Oncorhynchus kisutch*	Threatened	Endangered
Steelhead	*Oncorhynchus mykiss*	Threatened	NL
REPTILES			
Green sea turtle	*Chelonia mydas*	Threatened	NL
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	NL
Pacific Ridley sea turtle	*Lepidochelys olivacea*	Threatened	NL
Loggerhead sea turtle	*Caretta caretta*	Threatened	NL

Source: The Chambers Group 2004
Note: NL= not listed

Study Area

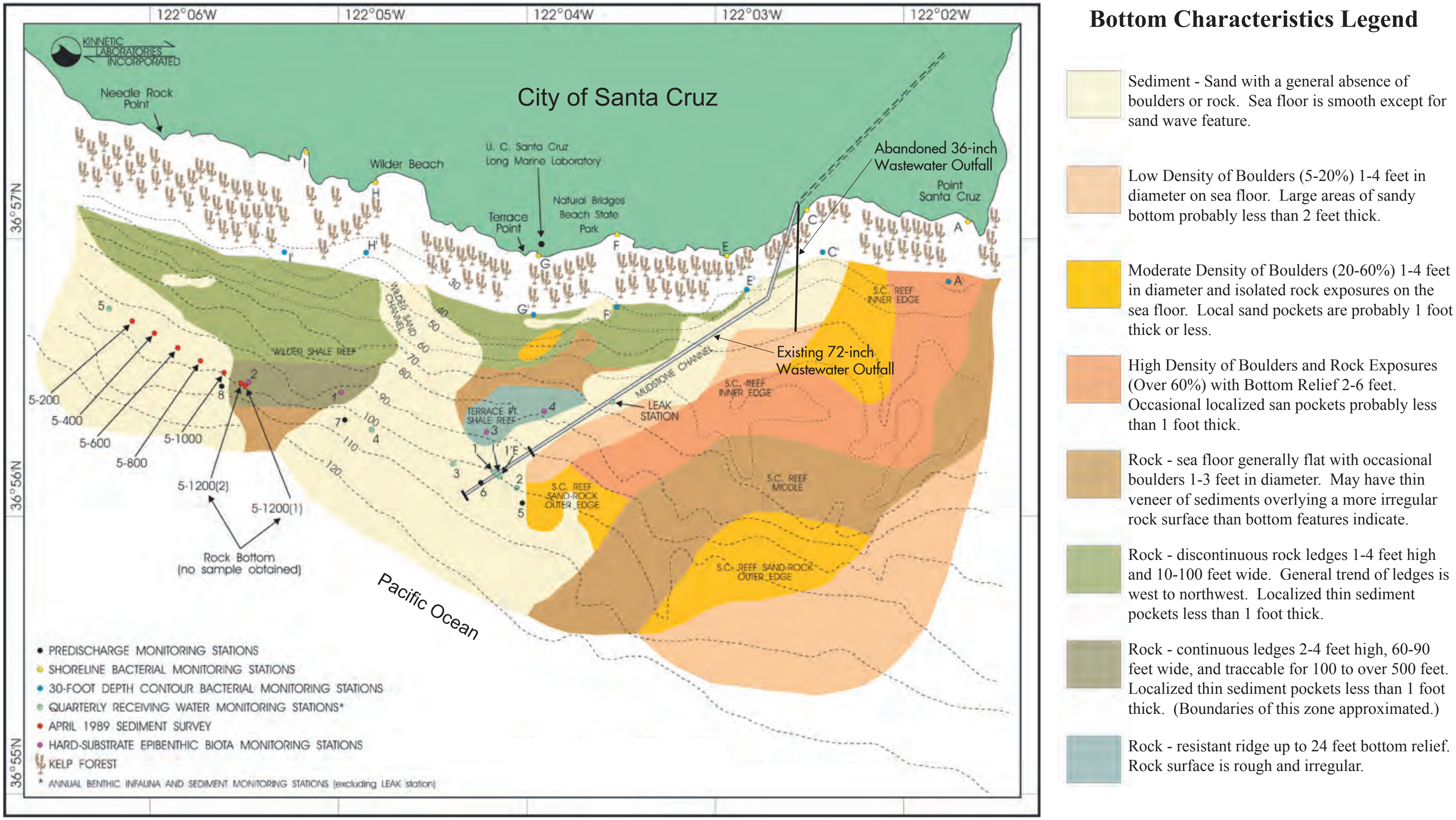
Ocean Habitat and Species

The proposed desalination facility would utilize an abandoned wastewater pipeline for the intake of seawater and a currently used wastewater pipeline for the discharge of concentrate. Seawater intake would occur through the abandoned 36-inch outfall owned by the City of Santa Cruz. This abandoned outfall, which is used only for emergency purposes, extends approximately 2,000 feet from the shore and terminates in 40 feet of water. Concentrate would be discharged through the City of Santa Cruz 72-inch wastewater outfall. This outfall extends seaward 12,250 feet toward Terrace Point and ends at the 110-foot depth contour (see Figure 5.2-2). The outfall includes a 2,100-foot diffuser with 176 ports that range from 2 to 4.25 inches in diameter (Kinnetic Laboratories 1999).

The study area consists of a complex mosaic of soft sediments, boulders, flat rock sea floor, discontinuous rock ledges, continuous rock ledges, and rocky ridges (Kinnetic Laboratories 1999). Figure 5.2-2 shows habitats in the vicinity of the proposed intake and outfall pipes. The intake and outfall are located within a sand channel between two pronounced rocky features, Terrace Point Shale Reef to the west and Santa Cruz Reef to the east. Brown and Caldwell (1978) described the sand channel traversed by the two pipelines as containing a layer of fine sand up to 6 inches thick overlying a flat mudstone bottom with occasional small rocks, boulders, and rocky outcroppings.

Common organisms in this area include the sea star, *Pisaster brevispinus*, and various hydroids and polychaetes. The diffuser section of the 72-inch wastewater outfall is located between Terrace Point Shale Reef and the outer edge of Santa Cruz Reef. Terrace Point Shale Reef is described as high-relief habitat, with ridges up to 24 feet high (Brown and Caldwell 1978; Kinnetic Laboratories 1999). The rocks are covered by a diverse assortment of species, including the anemone *Corynactis californica*, the hydroid *Plumularia* spp., the solitary corals *Paracyathus stearnsi* and *Balanophyllia elegans*, and a variety of nudibranchs (Brown and Caldwell 1978). Fishes associated with Terrace Point Shale Reef include lingcod (*Ophiodon elongatus*), cabezon (*Scorpaenichthys marmoratus*), and a variety of rockfishes (*Sebastes* spp.). The outer edge of Santa Cruz Reef is described as having a low to moderate density of boulders 1–4 feet in diameter (Kinnetics Laboratory 1999). Biotic cover on the outer edge of Santa Cruz Reef is sparse and diversity is low (Brown and Caldwell 1978). Common organisms include the anemone *Metridium senile* and brittle stars.

The terminus of the 36-inch abandoned outfall is located between the inner edge of Terrace Point Shale Reef and Santa Cruz Reef inner edge. Terrace Point Shale Reef in the vicinity of the proposed intake is characterized by discontinuous rock ledges, 1–4 feet high and 10–100 feet wide, with localized thin sediment pockets less than 1 foot thick (Kinnetic Laboratories 1999). The Santa Cruz Reef inner edge consists of a moderate density of boulders 1–4 feet in diameter, and isolated rock exposures within sand pockets up to 1 foot thick (Kinnetics Laboratories 1999). Relief on the inner edge of Santa Cruz Reef can reach 3–6 feet in height, and biotic cover is rich (Brown and Caldwell 1978). Characteristic species in this habitat include the anemone *Corynactis*, the solitary coral *Balanophyllia*, the sea urchin *Strongylocentrotus franciscanus*, and a variety of sponges and rockfishes.



NOTE: Location of Santa Cruz predischarge monitoring stations (5, 6, 7, and 8), out fall shoreline bacterial monitoring stations (A, C, E, F, G, H, and I), 30-foot depth contour bacterial monitoring (A', C', E', F', G', H', and I'), quarterly receiving water monitoring stations (1, 2, 3, 4, 5, and LEAK), benthic infauna and sediment stations locations (1, 2, 3, 4, and 5), April 1989 sediment survey (Stations 5-200 through 5-1200(2)), and hard-substrate epibenthic biota monitoring stations (Wilder Reef: *1* and *2*; and Terrace Point Reef: *3* and *4*).

Source: Kinematic Laboratories Inc. 2003

N

0 500 1000 2000

METERS

Depth Contours in Feet

FIGURE 5.2-2

Bottom Characteristics in the Vicinity of the Existing 72-inch Wastewater Outfall

Kelp beds occur inshore of the intake and discharge points. This inshore habitat is characterized by irregular rock outcroppings 2–4 feet high with sand channel intrusions (Brown and Caldwell 1978). The rocks support dense algal growth dominated by the giant kelp *Macrocystis pyrifera* and a variety of other species of red and brown algae. Rocky areas with enough relief to avoid sand scour are covered with an epifauna comprised of many species of hydroids, tunicates, sponges, anemones, gastropods, sea stars, and tube worms. Pholad clams, juvenile rockfishes, sanddabs (*Citharichthys* spp.), cottids, the sea star *Pisaster ochraceus*, and rock crabs (*Cancer* spp.) are common.

The City of Santa Cruz samples the soft-bottom benthic community in the vicinity of the 72-inch wastewater outfall in October of each year (Kinnetics Laboratories 1999). The five most abundant taxa are the polychaete worms *Apoprionospio pygmaea* and *Mediomastus* sp., the anemone *Edwardsia* sp., and unidentified oligochaete and nematode worms. These taxa are typical of high-energy, open-coast, sand-bottom communities off California. The diversity of the infaunal community in the study area appears to have been relatively consistent over time. However, there have been changes in abundance that appear to be related to regional phenomena.

The diversity of habitats in the study area supports a wide variety of fishes. Table 5.2-2 lists some of the common fish species of the study area. The only listed marine fish species in the study area are the salmonids (*Onchorhynchus* spp.). However, many species of rockfish, including boccacio (*Sebastes paucispinus*), black rockfish (*Sebastes melanops*), canary rockfish (*Sebastes pinniger*), copper rockfish (*Sebastes caurinus*), and greenspotted rockfish (*Sebastes chlorostichus*) that inhabit the study area have been declining in recent years (Wilson-Vandenberg 2000). Rockfish stocks in the Sanctuary, in general, are still healthy, but appear to be depressed (Danbom 1999).

Seabird colonies in the study area between Terrace Point and Point Santa Cruz include western gull (*Larus occidentalis*), pigeon guillemot (*Cepphus columba*), and possibly black oystercatcher (*Haematopus bachmani*) (Carter et al. 1992). Seabirds observed regularly in the study area include red-throated loon (*Gavia stellata*), common loon (*Gavia immer*), Pacific loon (*Gavia pacifica*), western grebe (*Aechmophorus occidentalis*), Clark’s grebe (*Aechmophorus clarkia*), eared grebe (*Podiceps nigricollis*), horned grebe (*Podiceps auritus*), double-crested cormorant (*Phalacrocorax auritus*), Brandt’s cormorant (*Phalacrocorax pencillatus*), pelagic cormorant (*Phalacrocorax pelagicus*), surf scoter (*Melanitta perspicillata*), white-winged scoter (*Melanitta fusca*), red-breasted merganser (*Mergus serrator*), Caspian tern (*Sterna caspia*), elegant tern (*Sterna elegans*), Forster’s tern (*Sterna forsteri*), the State and Federal Endangered California brown pelican, and five species of gull (*Larus spp*.) (Strelow Consulting 1997).

The most commonly observed marine mammals in the study area are harbor seals (*Phoca vitulina*), California sea lions (*Zalophus californianus*), and the Federal Threatened sea otter (Brown and Caldwell 1978; Strelow Consulting 1997). Seal Rock off of Point Santa Cruz is a major hauling-out site for pinnipeds. A hauling-out site is a place where pinnipeds regularly come ashore.

Table 5.2-2
Fish Species Commonly Found in the Study Area

COMMON NAME	SCIENTIFIC NAME
Calico surfperch	*Amphistichus koelzi*
Sablefish	*Anoplopoma fimbria*
Jacksmelt	*Atherinopsis californiensis*
Pacific sanddab	*Citharichthys sordidus*
White seabass	*Atractoscion nobilis*
Pile surfperch	*Rhacochilus vacca*
Black surfperch	*Embiotoca jacksoni*
Striped surfperch	*Embiotoca lateralis*
White croaker	*Genyonemus lineatus*
Opaleye	*Girella nigricans*
Giant kelpfish	*Heterostichus rostratus*
Kelp greenling	*Hexagrammos decagrammus*
Rainbow surfperch	*Hypsurus caryi*
Salmon	*Onchorhynchus spp.*
Lingcod	*Ophiodon elongatus*
Painted greenling	*Oxylebius pictus*
Kelp rockfish	*Sebastes atrovirens*
Gopher rockfish	*Sebastes carnatus*
Copper rockfish	*Sebastes caurinus*
Greenspotted rockfish	*Sebastes chlorostictus*
Black and yellow rockfish	*Sebastes chrysomelas*
Widow rockfish	*Sebastes entomelas*
Yellowtail rockfish	*Sebastes flavidus*
Chilipepper	*Sebastes goodei*
Black rockfish	*Sebastes melanops*
Vermillion rockfish	*Sebastes miniatus*
Blue rockfish	*Sebastes mystinus*
Bocaccio	*Sebastes paucispinis*
Canary rockfish	*Sebastes pinniger*
Olive rockfish	*Sebastes serranoides*
Grass rockfish	*Sebastes rastrelliger*
Jack mackerel	*Trachurus symmetricus*

Source: The Chambers Group 2004

Any of the listed species that occur in the Sanctuary (Table 5.2-1) potentially could occur in the study area. However, most of them would occur rarely in the nearshore area in the vicinity of the proposed intake and outfall. The listed species that would occur most commonly in the study area include the southern sea otter, the marbled murrelet, the California brown pelican, and the salmonids (*Oncorhynchus* spp.).

<u>Beach Habitat and Species</u>

UC Santa Cruz (UCSC) has studied the intertidal community at Terrace Point, about one-half mile west of the project site (Strelow Consulting 1997). The rocky intertidal assemblages in the study area are assumed to be similar. The rocky shore biotic community at Terrace Point was typical of that found on rocky shores in northern Santa Cruz County. In December 1992, UCSC researchers observed 108 species of marine plants and animals along the shore between the bluffs and approximately 1 foot below mean lower low water (MLLW). Organisms such as the acorn barnacle *Balanus glandula*, adapted to extended periods of exposure to air, are abundant in the upper intertidal. Farther down the shore, mussels (*Mytilus californianus*) and gooseneck barnacles (*Pollicipes polymerus*), interspersed with mats of red algae, form dense beds that harbor populations of crabs and gastropods. At the lower reaches of the intertidal zone, a variety of species of fleshy red algae covers the rocks, and in the lower reaches of the intertidal zone, surfgrass (*Phyllospadix torreyi*) provides cover for invertebrates and fishes.

Birds using the rocky shore in the study area are principally gulls and shorebirds (Strelow Consulting 1997). Shorebirds are present almost year-round, but there is a decline in their use of this habitat from mid-May to July, when most have moved north to breed. Typical shorebirds that forage in the intertidal zone in the study area include black-bellied plover (*Pluvialis squatarola*), black oystercatcher, willet (*Catoptrophorus semipalmatus*), wandering tattler (*Heteroscelus incanus*), whimbrel (*Numenius phaeopus*), marbled godwit (*Limosa fedoa*), ruddy turnstone (*Arenaria interpres*), black turnstone (*Arenaria melanocephalia*), surfbird (*Aphriza virgata*), and sanderling (*Calidris alba*). The Federal Threatened western snowy plover breeds to the west of the study area at the mouth of Wilder Creek. Wilder Creek Beach has been designated as critical habitat for snowy plover (Miller et al. 1999). Snowy plovers probably forage at times in the intertidal habitat of the study area.

Gulls use the rocky shore for resting and foraging among the tide pools. Nine species of gulls occur regularly along the rocky shore in the study area (Strelow Consulting 1997). They are most abundant in fall and winter. Terns, including Caspian, elegant, and Forster's terns, use the reef for resting. Great blue herons (*Ardea herodias*) and great egrets (*Casmerodius albus*) sometimes feed on the rocky reef. Harbor seals sometimes haul out on reefs in the study area.

The existing pipelines that would be used for the seawater intake and concentrate outfall come ashore on a sand beach. Rocky intertidal habitat occurs to the immediate west of the proposed outfall pipeline.

5.2.3 Regulatory Framework

Regulations relating to marine resources that may be applicable to the proposed Program are described below. The applicability to the proposed Program is discussed for each regulation. Regulations pertaining to water quality are discussed in Section 5.1, Hydrology and Water Quality.

Federal

Endangered Species Act of 1973

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) have authority over projects that may affect the continued existence of a federally listed (threatened or endangered) species. Pursuant to the requirements of the FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed or proposed species may be present in the project region, and determine whether the proposed project would have a potentially significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under FESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3],[4]). The"take"[1] prohibition of the FESA prohibits any action that adversely affects a single member of an endangered or threatened species.

Section 7 of the FESA outlines procedures for federal interagency cooperation to protect and conserve federally listed species and designated critical habitat. Critical habitat identifies specific areas that have the physical and biological features that are essential to the conservation of a listed species and that may require special management considerations or protection. Section 7(a)(2) requires federal agencies to consult with the USFWS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat.

For projects where federal action is not involved and take of a listed species may occur, the project proponent may seek an incidental take permit under Section 10(a) of the FESA. Section 10(a) allows the USFWS to permit the incidental take of listed species if such take is accompanied by a Habitat Conservation Plan that includes components to minimize and mitigate impacts associated with the take.

Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (16 USC Section 703, Supp. I 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs.

[1] "Take," as defined in Section 9 of the FESA, is broadly defined to include intentional or accidental "harassment" or "harm" to wildlife. "Harass" is further defined by the USFWS as an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering. "Harm" is defined as an act that actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC section 661 et seq.) requires federal agencies such as the U. S. Army Corps of Engineers (the Corps) to coordinate federal actions with the USFWS and NOAA Fisheries to conserve fish and wildlife resources. The administering agency is the USFWS for birds and NOAA Fisheries for marine fishes, marine mammals, and sea turtles. The Corps would coordinate with USFWS and NOAA Fisheries during the Section 10/404 permitting process for the proposed Program.

Marine Mammal Protection Act

The Marine Mammal Protection Act (16 USC 1361–1375) provides protection for marine mammals. If NOAA Fisheries determines that construction of the proposed Program could harass marine mammals, incidental harassment authorization may be required.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 et seq.) was passed to take immediate action to conserve and manage the fishery resources found off the coast of the United States. Section 395 (b)(4)(A) of this act specifies that if NOAA Fisheries determines that an action undertaken by a state or federal agency would affect any essential fish habitat, it would recommend measures to conserve such habitat. During the Section 404 permitting process, the Corps would consult with NOAA Fisheries regarding the impacts of the proposed Program on essential fish habitat.

National Marine Sanctuaries Marine Protection, Research, and Sanctuaries Act

The National Marine Sanctuaries Marine Protection, Research, and Sanctuaries Act (16 USC 1431 et seq.) established marine sanctuaries to protect and manage valuable marine areas. The proposed Program would involve seawater intake and concentrate discharge within the waters of the Sanctuary. The Monterey Bay National Marine Sanctuary would provide input during the environmental and permitting process as to whether the proposed Program would threaten the basic integrity of the site's resource values. Sanctuary input on the RWQCB NPDES permit conditions regarding concentrate discharge would be required.

The Monterey Bay National Marine Sanctuary is currently updating its management plan (MBNMS 2003). The management plan includes a proposed desalination action plan to minimize the impacts to marine resources in the Sanctuary from desalination activities. This action plan lays out a framework for a regional approach to address desalination, aimed at reducing impacts to marine resources in the Sanctuary through consideration of regional planning, facility siting issues, on-site mitigation measures, modeling and monitoring, and outreach and information exchange. The desalination action plan proposes five strategies to reduce desalination impacts on the Sanctuary:

1. Develop and implement a regional planning program to address desalination facility development and operation in the Sanctuary. This strategy will provide increased coordination and planning among desalination proponents and relevant agencies that presently are dealing with an array of independent desalination proposals.

2. Develop and implement a set of desalination facility siting guidelines and recommendations to minimize impacts to Sanctuary resources.
3. Define and implement environmental standards for desalination facilities operating in the Sanctuary.
4. Develop information requirements, including modeling and monitoring programs, for parties seeking NPDES permits for desalination facilities in the Sanctuary.
5. Develop a program for outreach and information exchange regarding desalination.

Clean Water Act

The Clean Water Act was established to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Sections 401, 402, and 404 of the Clean Water Act control the discharge of pollutants and wastes into freshwater and marine environments. Please refer to Section 5.1, Hydrology and Water Quality, for a discussion of these sections of the Clean Water Act.

Rivers and Harbors Act

Please refer to Section 5.1, Hydrology and Water Quality, for a discussion of the Rivers and Harbors Act.

State

California Endangered Species Act of 1984

Under the California Endangered Species Act (CESA), the California Department of Fish and Game (CDFG) has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code 2070). The CDFG also maintains a list of "candidate species," which are species formally noticed as being under review for addition to either the list of endangered species or the list of threatened species. The CDFG also maintains lists of species of special concern, which serve as "watch lists." Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project region and determine whether the proposed project will have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that may impact a candidate species. Program-related impacts to species on the CESA endangered list and threatened list would be considered significant in this EIR. Impacts to species of special concern would be considered significant under the circumstances described in Section 5.2.4, below.

Fully Protected Species

Fish and Game Code Sections 3511, 4700, 5050, and 5515 prohibit the take of animals that are classified as fully protected in California. Fully protected animals may not be taken or possessed at any time. Several fully protected species occur in the study area, including California brown pelican, southern sea otter, Guadalupe fur seal, and northern elephant seal (*Mirounga augstirostris*).

<u>California Coastal Act of 1976</u>

The California Coastal Act was established to preserve, protect, and where possible, restore the resources of the coastal zone for the enjoyment of the current and succeeding generations. The California Coastal Act is administered by the California Coastal Commission. Because the proposed Program is in the coastal zone, the California Coastal Commission would have to determine that it is consistent with the policies of the California Coastal Act. The following policies of the Coastal Act are particularly applicable to marine resources.

Policy 30230

This policy states that marine resources shall be maintained, enhanced, and where feasible, restored, and that special protection shall be given to areas and species of special biological or economic significance. This policy also specifies that uses of the marine environment be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms.

Policy 30231

This policy states that biological productivity and the quality of coastal waters, streams, wetlands, estuaries and lakes appropriate to maintain optimum populations of marine organisms and to protect human health shall be maintained and, where feasible, restored through, among other means: minimizing adverse effects of wastewater discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface water flow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

The Coastal Commission recently issued an informational paper (Seawater Desalination and the Coastal Act, March 2004) that describes how desalination issues relate to existing Coastal Act policies and discusses how these policies are likely to apply to a desalination proposal (California Coastal Commission 2004). Because each proposed desalination facility will have unique design and siting characteristics, each is likely to be subject to a different set of Coastal Act policies and likely will conform to those policies in different ways. Therefore, each proposed desalination facility will require case-by-case review to determine Coastal Act conformity, adverse impacts, and the measures necessary to avoid and mitigate for those impacts. Conformity with Coastal Act policies 30230 and 30231 requires the evaluation of alternative locations and mitigation measures that avoid or minimize adverse effects on marine biological resources and that, where feasible, restore those resources.

<u>City and County General Plans and Local Coastal Programs</u>

The general plans of affected jurisdictions provide policies regarding marine resources. Policies relevant to the proposed Program are presented in Appendix B.

5.2.4 Impacts and Mitigation Measures

Significance Criteria

An impact to marine resources would be considered significant if:

- Any part of the population of a threatened, endangered, or candidate species is adversely affected or if its habitat is lost or disturbed;
- A net loss occurs in the functional value of a sensitive biological habitat, including kelp beds, surfgrass beds, high-relief rocky subtidal zones, or rocky intertidal zones;
- The movement or migration of fish or wildlife is substantially impeded; or
- A substantial loss occurs in the population or habitat of any native fish, wildlife, or vegetation, or if there is an overall loss of biological diversity. “Substantial” is defined as any change that could be detected over natural variability.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and specific components where impacts differ between the alternatives. Evaluation of impacts associated with subsequent expansion is also provided where relevant. Table 5.2-3 summarizes potentially significant impacts.

Table 5.2-3
Summary of Potential Impacts – Marine Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITY		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP. FACILITY	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITY
Impact 5.2-1: The intake of seawater for desalination would affect marine organisms through impingement and entrainment.	○	○	○	◐	--	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.2-2: Concentrate discharge could affect marine organisms by subjecting them to elevated salinity or by changing the characteristics of the wastewater discharge in such a way that pollutants in the discharge reached levels harmful to marine organisms.	○	○	○	○	--	--	--	--	--	--	--	--	--	--	--	--	--

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Table 5.2-3 (continued)
Summary of Potential Impacts – Marine Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITY		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP. FACILITY	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITY
Impact 5.2-3: During construction to modify the abandoned 36-inch outfall pipeline for seawater intake, anchors and/or moorings of construction vessels would disturb soft-bottom habitat.	○	○	--	--	○	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.2-4: Disturbance to offshore high-relief, hard-bottom, subtidal habitat by anchors or moorings	◐	◐	--	--	◐	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.2-5: Excavation of sediment around the end of the 36-inch pipe to facilitate modifications for the seawater intake would temporarily disturb soft-bottom benthos in the excavated sediment, and re-suspended sediment could affect organisms in nearby rocky habitat.	○	○	--	--	○	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.2-6: The temporary noise and disturbance due to offshore construction could cause marine mammals and seabirds to avoid the construction area.	○	○	--	--	○	--	--	--	--	--	--	--	--	--	--	--	--

(continued on next page)

Table 5.2-3 (continued)
Summary of Potential Impacts – Marine Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITY		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP. FACILITY	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITY
Impact 5.2-7: Construction activities to add pumps to the junction structure on the beach near the intersection of West Cliff Drive and Sunset Avenue would disturb sandy intertidal invertebrates.	○	○	--	--	--	○	--	--	--	--	--	--	--	--	--	--	--
Impact 5.2-8: Construction activity at the beach near the intersection of West Cliff Drive and Sunset Avenue would cause most shorebirds to avoid the area during construction.	○	○	--	--	--	○	--	--	--	--	--	--	--	--	--	--	--
Impact 5.2-9: Disturbance to rocky intertidal invertebrates from construction activities to modify junction structure	◐	◐	--	--	--	◐	--	--	--	--	--	--	--	--	--	--	--

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

Impacts and Mitigation

☒ **Impact 5.2-1: The intake of seawater for desalination would affect marine organisms through impingement and entrainment. Less than Significant for all Alternatives and Increments. Recommended Mitigation for Alternative D-2 (Subsequent Increment).**

General Discussion (Applicable to Both Alternatives)

The proposed intake of seawater for the desalination facility would affect marine organisms through impingement and entrainment. Impingement takes place when organisms are trapped against the intake screens by the force of the water passing through the desalination facility intake structure. Entrainment occurs when organisms are drawn through the intake structure into the desalination plant. Organisms small enough to pass through the screens and become entrained in the desalination system include phytoplankton and zooplankton. Zooplankters that may become entrained include not only animals such as copepods that spend their entire lives in the plankton, but also the larvae of benthic invertebrates and fish eggs. Impingement and entrainment by the intakes of power plants, which typically may use 500 mgd or more for once-through cooling systems, have been found to have significant adverse impacts on fish populations (Tenera 2000a; Tenera 2000b).

Alternative D-1 (Applicable to the First Increment of this Alternative Only)

Under Alternative D-1, the desalination facility would only be operated when peak demands are not met by existing supply sources. Thus, under this alternative, the intake of seawater would essentially occur only during periods of drought. It is expected, that under this scenario, the plant would operate at 2.5 mgd for approximately six months during a six-year period. Operation of the plant would generally occur during the warmer months of May to October when water demand is highest. When the desalination plant operates at its full 2.5-mgd capacity, it would take in approximately 5.8 mgd of seawater.

Impingement and entrainment impacts could be avoided by the use of beach wells rather than an ocean intake. However, beach wells are infeasible for this project ”due to the small geometry (long, narrow beach areas resulting in a limited saturated thickness) and relatively high percentage of fine-grained material in the beach sands (limits ability to produce significant quantities for a sustained period of time)” (Carollo 2002). Although impingement and entrainment impacts cannot be avoided entirely, the proposed intake structure would be designed to substantially reduce impingement and entrainment impacts on marine life. Entrainment would be reduced by the fine-mesh screen, which would have a mesh spacing of 0.1 inches (2.4 mm). The mesh size is small enough to exclude many fish larvae. The U.S. Environmental Protection Agency (USEPA) has found that fine-mesh wedgewire screens may be effective in reducing entrainment (USEPA 2001a). In one study cited by the USEPA, 1-mm and 2-mm screens reduced larvae entrainment by 99 percent and 62 percent, respectively, compared to conventional 9.5-mm screens. In addition to fine-mesh screens, the proposed intake system would have a relatively gentle intake velocity of 0.5 feet per second when operating at maximum capacity. At this low velocity, many organisms would be able to avoid becoming impinged on the screens. Based on studies, the USEPA has determined that a 0.5 feet per second intake velocity protects about 96 percent of tested fish (USEPA 2001b).

Without a detailed, site-specific study, it is impossible to determine the exact impact the proposed seawater intake would have on marine life. Marine organisms tend to be patchy in distribution, and a seawater intake could take a heavy toll on a species if a substantial amount of the local population occurred near the intake and that species was vulnerable to impingement and entrainment. However, the maximum near-term seawater withdrawal of 5.8 mgd proposed for Alternative D-1 is about two orders of magnitude less than the seawater withdrawal of power plants where studies have identified significant impacts. Furthermore, under Alternative D-1, seawater intake would only occur under drought conditions (potentially six months out of six years). During most years, the plant would not operate, and marine life would not be subject to impingement or entrainment from the intake. Seawater withdrawal would be expected to occur primarily during the warm summer months, a time of year when plankton populations, in general, are not at peak abundance. Finally, the seawater intake would be designed with fine-mesh wedgewire screens and a low through-screen velocity to reduce impingement and entrainment. Therefore, because the amount of seawater withdrawn would be relatively low and would only occur sporadically, and because the intake has been designed to reduce impingement and entrainment, the impact of intake operation on marine resources is considered to be less than significant.

The only listed species that could be vulnerable to the direct impacts of the intake are the listed salmonids, including steelhead, Chinook salmon, and coho salmon. These species do not have pelagic eggs and larvae and thus would not be subject to entrainment. Because the intake would be designed with a very gentle through-screen velocity, salmonids would be able to escape the intake and avoid impingement. Therefore, the impacts of the proposed seawater intake to listed fish species would be less than significant.

Although the proposed seawater intake would not likely have a significant impact on marine resources, this issue should be examined in more detail when a specific project has been designed and CEQA review is undertaken for that project. Without detailed, site-specific studies, it is impossible to determine whether or not any species in the study area would be particularly vulnerable to the impacts of the seawater intake. At the time a specific project is designed, additional information may be available to determine whether the intake could have a significant impact on any particular species.

The City of Santa Cruz would need to obtain a coastal development permit for the intake. The Coastal Commission has expressed concern about entrainment and impingement impacts from seawater intakes. Under the Coastal Act, the Coastal Commission is required to consider all feasible mitigation measures to avoid or reduce impacts, even if those impacts are determined to be less than significant under CEQA. The Coastal Commission may require studies to better determine the impacts of the intake before it would issue a coastal development permit for the project. Depending on what impacts are identified, the Coastal Commission may also require mitigation for those impacts. The City of Santa Cruz would comply with any conditions specified in the coastal development permit.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

As discussed under Alternative D-1, the seawater intake would affect marine organisms through impingement and entrainment. The greater frequency of desalination plant operation under Alternative D-2 compared to Alternative D-1 increases the potential for significant entrainment and impingement impacts to marine organisms, particularly because the plant may be operated in the spring, when plankton organisms are at maximum abundance. Furthermore, because the plant would operate throughout the year in every year, species vulnerable to impingement and/or entrainment would suffer losses every year. Under Alternative D-2, the plant would operate at 1.25 mgd most of the time, and at its maximum capacity of 2.5 mgd only during drought conditions (or approximately six months out of every six years) or for short durations when SqCWD needs to recharge its groundwater aquifer. Without a site-specific study, it is impossible to predict the exact impacts of the seawater intake. However, because the maximum daily seawater intake of 5.8 mgd would be much lower than intake volumes found to have significant adverse impacts on marine organisms and because the intake has been designed to reduce impingement and entrainment losses, impacts of the seawater intake under Alternative D-2 are expected to be less than significant.

Although the proposed seawater intake is unlikely to have a significant impact on marine resources, this issue should be examined in more detail when a specific project has been designed and an EIR is produced for that project. Without detailed, site-specific studies, it is impossible to determine whether or not any species in the study area would be particularly vulnerable to the impacts of the seawater intake. At the time a specific project is designed, additional information may be available to determine whether the intake could have a significant impact on any species.

The City of Santa Cruz would need to obtain a coastal development permit for the intake. The Coastal Commission has expressed concern about entrainment and impingement impacts from seawater intakes. Under the Coastal Act, the Coastal Commission is required to consider all feasible mitigation measures to avoid or reduce impacts, even if those impacts are determined to be less than significant under CEQA. The Coastal Commission may require studies to better determine the impacts of the intake before it would issue a coastal development permit for the project. Depending on what impacts are identified, the Coastal Commission may also require mitigation for those impacts. The City of Santa Cruz would comply with any conditions specified in the coastal development permit.

Alternatives D-1 and D-2 (Applicable to Subsequent Increments of Both Alternatives)

In the future under Alternatives D-1 and D-2, the plant may expand to a capacity of 3.5 mgd and eventually to a capacity of 4.5 mgd. A 4.5-mgd desalination facility would take in about 10.5 mgd of seawater when operating at maximum capacity. This volume of intake is relatively small compared to the typical cooling-water intake of coastal power plants.

Alternative D-1 (Applicable to Subsequent Increments of this Alternative Only)

Under Alternative D-1, in which seawater intake would occur only under drought conditions, impacts of impingement and entrainment would likely remain less than significant. Under future plant expansion, the plant would only operate approximately eight months out of a six-year period, or a little over 10 percent of the time. During drought conditions, the plant would most likely operate at maximum capacity. Most of the time, however, the plant would not be taking in seawater, and no losses due to impingement and entrainment would occur. Operation at maximum capacity would primarily occur in summer and fall, when plankton abundance tends to be low.

At a later time, the City may opt to operate continuously with SqCWD at a level of 1.25 mgd. The impacts associated with this operation would be the same as those identified for Alternative D-2, First Increment, as described above.

Alternative D-2 (Applicable to Subsequent Increments of this Alternative Only)

Under Alternative D-2, the plant would operate at 1.25 mgd most of the time, but at maximum capacity (3.5 mgd and eventually 4.5 mgd) during drought conditions. Under Alternative D-2, it is expected that the plant would operate at maximum capacity approximately eight months out of every six years, or a little over 10 percent of the time. Therefore, species vulnerable to impingement and/or entrainment would probably suffer some losses every year. However, the daily seawater intake would be low most of the time, and the intake has been designed to reduce impingement and entrainment losses; therefore, impingement and entrainment losses are expected to be small. Even the maximum intake of 10.5 mgd under the projected future plant expansion to 4.5 mgd is much less than the intake of coastal power plants found to have significant adverse impacts on marine organisms. Impacts of Alternative D-2 under future plant expansion are expected to remain less than significant.

At a later time, the City may opt to operate continuously with SqCWD at a level of 1.25 mgd. This combined operation would result in a total operation of 2.5 mgd every day, with a resulting daily intake of 5.8 mgd. In addition, during drought conditions under this scenario, the plant might run at a maximum production of 3.5 and eventually 4.5 mgd. Maximum operations under drought conditions would be expected to occur about eight months out of every six years, or a little over 10 percent of the time. Under this scenario, because of the continuous operation, species vulnerable to impingement and/or entrainment would probably suffer some losses every year. However, the daily seawater intake would be low most of the time, and the intake has been designed to reduce impingement and entrainment losses. Therefore, impingement and entrainment losses are expected to be small. Even the maximum intake of 10.5 mgd under the projected future plant expansion to 4.5 mgd is much less than the intake of coastal power plants found to have significant adverse impacts on marine organisms. Impacts of Alternative D-2 under future plant expansion are expected to remain less than significant.

The City of Santa Cruz would need to obtain a coastal development permit for the intake. The Coastal Commission has expressed concern about entrainment and impingement impacts from seawater intakes. Under the Coastal Act, the Coastal Commission is required to consider all feasible mitigation measures to avoid or reduce impacts, even if those impacts are determined to be less than significant under CEQA. The Coastal Commission may require studies to better determine the impacts of the intake before it would issue a coastal development permit for the project. Depending on what impacts are identified, the Coastal Commission may also require mitigation for those impacts. The City of Santa Cruz would comply with any conditions specified in the coastal development permit.

Mitigation Measures

Recommended Measure 5.2-1: None required for 2.5-mgd facility or 4.5-mgd facility under Alternative D-1. Under Alternative D-2, with a 4.5-mgd-capacity facility, the City of Santa Cruz would need to undertake relevant studies to quantify impacts to species, determine the significance of those impacts, and identify mitigation measures if appropriate.

Significance After Mitigation: Less than Significant.

Impact 5.2-2: Concentrate discharge could affect marine organisms by subjecting them to elevated salinity or by changing the characteristics of the wastewater discharge in such a way that pollutants in the discharge reached levels harmful to marine organisms. Less than Significant.

The high-salinity by-product of the reverse osmosis desalination process would be diluted with treated effluent from the WWTP and discharged to the ocean through the existing 72-inch wastewater outfall. The desalination concentrate would connect to the City's wastewater outfall either at the treatment plant site or at the junction structure on the beach near the intersection of West Cliff Drive and Sunset Avenue.

Alternative D-1 (Applicable to the First Increment of this Alternative Only)

Please refer to Section 5.1, Hydrology and Water Quality, for a discussion of effects of the concentrate discharge on ocean water quality. The proposed desalination plant could adversely affect the marine environment, if the salinity of the discharge were at a concentration that could have adverse effects on marine organisms, or if the addition of the desalination plant wastes to the existing wastewater plume changed the characteristics of the discharge such that pollutants in the wastewater discharge were at a concentration high enough to have adverse effects on marine organisms. Marine organisms have been found to be sensitive to changes in salinity (Robert Bein, William Frost and Associates 1995; ABA Consultants 1992). However, because the concentrate from the desalination plant would be diluted by treated wastewater effluent to a salt concentration near seawater, the proposed Program would not result in the discharge of elevated-salinity wastes to the ocean. The initial concentration of the combined discharge would be slightly less than ambient seawater (28 to 32 parts per thousand) and well within the range tolerated by marine organisms. Dilution of the City of Santa Cruz wastewater plume would be greater than the 114:1 required by the existing NPDES permit. Because NPDES permit requirements are set to protect the marine environment, addition of the concentrate to the treated wastewater plume would not result in adverse effects. Impacts of concentrate discharge from the desalination plant on marine resources would be less than significant (Impact 5.2-9).

The discharge of concentrate through the existing City of Santa Cruz wastewater outfall would probably require modification from the RWQCB of the City's existing NPDES permit for the wastewater discharge. The RWQCB may impose additional conditions to the permit for the combined discharge. The City of Santa Cruz would comply with all permit conditions.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Under Alternative D-2, more frequent operation of the desalination plant means that concentrate would be discharged to the ocean over a longer period of time. As discussed under Alternative D-1, the concentrate waste from the desalination process would be mixed with treated wastewater from the WWTP prior to ocean discharge. Dilution of the concentrate by the treated wastewater discharge, which has a salinity close to freshwater, would bring the salinity of the combined discharge close to that of seawater. The blending of the two effluents would be designed to achieve the 114:1 dilution required by the existing NPDES permit. Because the salinity of the discharge would be close to seawater and because the dilution would exceed levels determined to be protective of the marine environment, the effects of concentrate discharge on the marine environment under Alternative D-2 would be less than significant.

The discharge of concentrate through the existing City of Santa Cruz wastewater outfall would probably require modification from the RWQCB of the City's existing NPDES permit for the wastewater discharge. The RWQCB may impose additional conditions to the permit for the combined discharge. The City of Santa Cruz would comply with all permit conditions.

Alternatives D-1 and D-2 (Applicable to Subsequent Increments of Both Alternatives)

It is assumed that when the desalination facility is expanded, concentrate discharge would be blended with the treated wastewater influent to maintain the 114:1 dilution required by the NPDES permit for the WWTP. Assuming this level of dilution is achieved, impacts of concentrate discharge on marine resources would remain less than significant.

The discharge of concentrate through the existing City of Santa Cruz wastewater outfall would probably require modification from the RWQCB of the City's existing NPDES permit for the wastewater discharge. The RWQCB may impose additional conditions to the permit for the combined discharge. The City of Santa Cruz would comply with all permit conditions.

Mitigation Measures

None required. Please refer to Section 5.1, Hydrology and Water Quality, for a discussion of the effects of concentrate discharge on ocean water quality.

Impact 5.2-3: During construction to modify the abandoned 36-inch outfall pipeline for seawater intake, anchors and/or moorings of construction vessels would disturb soft-bottom habitat. Less than Significant.

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

The abandoned 36-inch wastewater outfall owned by the City of Santa Cruz, which is currently used only for emergency discharges, would be converted to a seawater intake system. Conversion of the abandoned outfall would involve installation of a new 24- to 27-inch lining within the pipe and the installation of screens and baffles at the end of the outfall pipe. The abandoned outfall ends about 2,300 feet from shore at a water depth of 40 feet. As discussed in the Existing Conditions section, the terminus of the pipe is located in a sand channel between the inner edges of Terrace Point Shale Reef and Santa Cruz Reef. Limited excavation of the seabed would probably be required to access the end of the existing outfall and facilitate the proposed pipeline modifications. Offshore construction details have not yet been developed. Construction would likely occur from floating barges and would include regular trips to and from the construction area by one or more boats.

During construction, the seafloor would be disturbed by anchors or moorings used to secure construction vessels. Anchors can cause considerable disturbance to the ocean bottom, scraping over a substantial area of bottom before they set. In soft-bottom areas, large anchors can dig trenches in the sediment while they are setting or if they drag. In hard-bottom areas, anchors can scrape encrusting organisms off rocks; large anchors can even dislodge or break rocks. Once anchors have set, their chains can swing back and forth across the bottom, causing further disturbance. Securing vessels to moorings causes less damage. The placement of the mooring on the seafloor disturbs the bottom in the immediate area where the mooring is placed, but the extensive damage that can be caused by the setting and dragging of anchors is avoided.

If anchoring or mooring of construction vessels during intake construction occurs in soft-bottom areas, organisms in sediment contacted by anchors would be disturbed. Studies have shown that shallow-water, soft-bottom communities in central California generally recover from disturbance within one to three years (Oliver et al. 1977). Because the area affect by anchors or moorings would be limited, and because the disturbance would be short term, the impact of construction vessel anchors or moorings to soft-bottom benthos would be considered less than significant. Therefore, no mitigation measures are required.

The City of Santa Cruz would likely be required to obtain a permit from the Corps under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act for the proposed offshore construction. The Corps would consult with the USFWS, NOAA Fisheries, CDFG, and the Monterey Bay National Marine Sanctuary regarding the permit. The Corps would likely impose conditions on the permit. In addition, if a Section 404 permit is required, the RWQCB must issue a water quality certification under Section 401 of the Clean Water Act. The RWQCB may also impose requirements on the construction. The offshore construction would occur within the coastal zone and would require a coastal development permit or coastal consistency determination from the Coastal Commission. The Coastal Commission would also likely impose requirements on the proposed construction. Finally, NOAA Fisheries could determine that the proposed offshore construction has the potential to harass marine mammals and might issue an incidental harassment authorization. The City of Santa Cruz would comply with all permit conditions during the proposed offshore construction.

Mitigation Measures

None required.

☒ **Impact 5.2-4: If construction vessel anchors or moorings contact high-relief rocky subtidal habitat during intake construction, long-lasting damage to the associated communities and possibly to the substrate itself could occur. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

Because rocky habitat occurs both east and west of the sand channel where the proposed intake pipe terminates, there is a possibility that construction vessels could anchor in rocky habitat. Terrace Point Shale Reef in the vicinity of the proposed intake is characterized by discontinuous rock ledges 1–4 feet high. Relief on the inner edge of Santa Cruz Reef is 3–6 feet high, and the reef supports a rich assemblage of invertebrates. Abrasion of low-relief rocks by anchors, chains, or moorings is unlikely to be significant because low-relief, hard-bottom areas at a 40-foot depth are subjected to frequent sand scour. However, damage to high-relief habitat could have significant adverse effects. Encrusting communities on high-relief substrate can be crushed or scraped by anchors. Many encrusting organisms, such as gorgonians and vase sponges, are slow growing and recruit irregularly. Recovery of high-relief, hard-bottom communities can take many years (Lissner et al. 1991). Anchor damage to high-relief habitat has been observed to persist many years after the original disturbance (Nekton 1987; MEC 1995). In addition, high-relief, hard-bottom communities support several species of rockfish (*Sebastes* spp.) that have been suffering from recent population declines. In the worst case, anchors may actually damage rocks and thus permanently degrade the habitat. Therefore, anchoring in high-relief, hard-bottom habitat could cause a net loss in the functional value of that habitat, and recovery could take many years. Anchor damage to high-relief rocky subtidal habitat during intake construction is a potentially significant impact that can be mitigated to a less-than-significant level.

The City of Santa Cruz would likely be required to obtain a permit from the Corps under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act for the proposed offshore construction. The Corps would consult with the USFWS, NOAA Fisheries, CDFG and the Monterey Bay National Marine Sanctuary regarding the permit. The Corps would likely impose conditions on the permit. In addition, if a Section 404 permit is required, the RWQCB must issue a water quality certification under Section 401 of the Clean Water Act. The RWQCB also may impose requirements on the construction. The offshore construction would occur within the coastal zone and would require a coastal development permit or coastal consistency determination from the Coastal Commission. The Coastal Commission also likely would to impose requirements on the proposed construction. Finally, NOAA Fisheries could determine that the proposed offshore construction has the potential to harass marine mammals and might issue an incidental harassment authorization. The City of Santa Cruz would comply with all permit conditions during the proposed offshore construction.

Mitigation Measure

Mitigation Measure 5.2-4: This mitigation measure applies to the raw water intake component. Prior to construction, a biological survey of the construction area shall be conducted to identify areas free of significant subtidal habitat. All construction vessels shall use moorings placed in the areas identified as free of significant high-relief habitat. With this mitigation, the impact of anchors on significant hard-bottom habitat would be mitigated to insignificant and damage to high-relief habitat would be avoided.

Significance After Mitigation: Less than significant.

⌦ **Impact 5.2-5: Excavation of sediment around the end of the 36-inch pipe to facilitate modifications for the seawater intake would temporarily disturb soft-bottom benthos in the excavated sediment, and re-suspended sediment could affect organisms in nearby rocky habitat. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

Some excavation around the end of the pipeline could be required to accommodate the modifications for the proposed intake. The excavation would probably be accomplished by dredging or jetting. Soft-bottom invertebrates in the excavated sediments would be disturbed by the excavation. Because the disturbance would be confined to a small area in the immediate vicinity of the pipeline and because recovery of the affected benthic community would be expected to occur within one to three years (Oliver et al. 1977), the impacts of the proposed excavation to soft-bottom benthos would be considered less than significant. Some of the sediment that would be re-suspended during excavation could be carried by currents into hard-bottom habitat, possibly affecting hard-bottom organisms. However, organisms that occur at a 40-foot depth off the open coast of California are frequently subjected to sediment suspended by wave surge. Because the excavation would occur within a limited area (and thus would involve a small volume of material) over a short period of time (probably one or two days), the impact of re-suspended sediment on hard-bottom organisms would be considered less than significant. Therefore, no mitigation measures are required.

The City of Santa Cruz would likely be required to obtain permits from the Corps under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act for the proposed offshore construction. The Corps would consult with the USFWS, NOAA Fisheries, CDFG and the Monterey Bay National Marine Sanctuary regarding the permit. The Corps would likely impose conditions on the permit. In addition, if a Section 404 permit is required, the RWQCB must issue a water quality certification under Section 401 of the Clean Water Act. The RWQCB also may impose requirements on the construction. The offshore construction would occur within the coastal zone and would require a coastal development permit or coastal consistency determination from the Coastal Commission. The Coastal Commission also likely would impose requirements on the proposed construction. Finally, NOAA Fisheries could determine that the proposed offshore construction has the potential to harass marine mammals and might issue an incidental harassment authorization. The City of Santa Cruz would comply with all permit conditions during the proposed offshore construction.

Mitigation Measures

None required.

⌦ **Impact 5.2-6: The temporary noise and disturbance due to offshore construction could cause marine mammals and seabirds to avoid the construction area. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

The noise and disturbance of offshore construction could cause marine mammals and seabirds to avoid the construction area. Because the amount of area affected would be limited to the immediate vicinity of the construction activities, and because construction would be temporary, the possible avoidance of the construction area by marine mammals and seabirds (including listed species) during offshore construction would be less than significant. Therefore, no mitigation measures are required.

NOAA Fisheries could determine that the proposed offshore construction has the potential to harass marine mammals, which would be a violation of the Marine Mammal Protection Act. NOAA Fisheries might issue an incidental harassment authorization for the offshore construction. If an incidental harassment authorization is issued, the City of Santa Cruz would comply with all requirements.

Mitigation Measures

None required.

⌦ **Impact 5.2-7: Construction activities to add pumps to the junction structure on the beach near the intersection of West Cliff Drive and Sunset Avenue would disturb sandy intertidal invertebrates. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

Construction activities to add pumps for the intake to the junction structure would involve construction on the beach. The beach adjacent to the junction structure is sand bottom. Construction equipment and activities would disturb organisms that use the beach. Sandy intertidal animals could be disturbed, crushed, buried, or displaced by construction activities. Sandy beach invertebrates are adapted to the seasonal movement of sand on and off the beach. Sandy beach invertebrates become established in the spring, when sand typically moves onto the shore. Therefore, sand beach populations disturbed by construction would be expected to reestablish the following spring, and disturbance would be limited to the immediate construction area for a year or less. The impact of junction structure modification to sand beach communities would be less than significant. Therefore, no mitigation measures are required.

If the proposed beach construction is below the mean high-tide line, a permit from the Corps could be required under Section 404 of the Clean Water Act. The Corps would consult with the USFWS, NOAA Fisheries, CDFG, and the Monterey Bay National Marine Sanctuary regarding the issuance of the permit. If a 404 permit is required, water quality certification under Section 401 of the Clean Water Act would also be required from the RWQCB. Because the proposed construction is in the Coastal Zone, a coastal development permit or coastal consistency determination would be required from the California Coastal Commission. The City of Santa Cruz would comply with all permit requirements.

Mitigation Measures

None required.

⌦ **Impact 5.2-8: Construction activity at the beach near the intersection of West Cliff Drive and Sunset Avenue would cause most shorebirds to avoid the area during construction. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

A variety of shorebirds forage on the beach in the vicinity of the junction structure. Shorebirds, including the Federal Threatened western snowy plover, are likely to avoid the area during construction. Because construction activities would be temporary and would be limited to the immediate vicinity of the junction structure, the impact of junction structure modification on shorebirds would be less than significant. Therefore, no mitigation measures are required.

If the proposed beach construction is below the mean high-tide line, a permit from the Corps could be required under Section 404 of the Clean Water Act. The Corps would consult with the USFWS, NOAA Fisheries, CDFG, and Monterey Bay National Marine Sanctuary regarding the issuance of the permit. If a 404 permit is required, water quality certification under Section 401 of the Clean Water Act would also be required from the RWQCB. Because the proposed construction is in the coastal zone, a coastal development permit or coastal consistency determination would be required from the California Coastal Commission. The City of Santa Cruz would comply with all permit requirements.

Mitigation Measures

None required.

Impact 5.2-9: Construction activities associated with the raw water intake pumping facility or pipeline connection at the beach (near the intersection of West Cliff Drive and Sunset Beach) could affect rocky intertidal habitat. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

Rocky intertidal habitat occurs immediately west of the existing 36-inch and 72-inch pipelines that come ashore at the junction structure. Like rocky subtidal habitat, rocky intertidal habitat is much more sensitive to disturbance than sandy intertidal habitat. Community succession following disturbance in the central California rocky intertidal is a complex phenomenon that varies depending on the life history characteristics of the organisms disturbed, dispersal, recruitment, and a variety of possible interactions among species (Foster et al. 1986). Recovery from disturbance may take many years. Therefore, disturbance to rocky intertidal habitat could result in a net loss of the functional value of the habitat. If construction activities extend into rocky intertidal habitat, the impact would be considered significant. Potential impacts to rocky intertidal communities could be mitigated to insignificant by confining all construction activities associated with the junction structure to sandy beach habitat.

If the proposed beach construction is below the mean high-tide line, a permit from the Corps could be required under Section 404 of the Clean Water Act. The Corps would consult with the USFWS, NOAA Fisheries, CDFG, and the Monterey Bay National Marine Sanctuary regarding the issuance of the permit. If a 404 permit is required, water quality certification under Section 401 of the Clean Water Act would also be required from the RWQCB. Because the proposed construction is in the coastal zone, a coastal development permit or coastal consistency determination would be required from the California Coastal Commission. The City of Santa Cruz would comply with all permit requirements.

Mitigation Measures

Mitigation Measure 5.2-9: This mitigation measure applies to the raw water intake pumping facility. Prior to any construction activities on the beach, a biologist shall flag intertidal rocky habitat to be avoided. All construction equipment and activities shall avoid the flagged areas. With this mitigation measure, impacts of beach construction on rocky intertidal habitat would be avoided.

Significance After Mitigation: Less than Significant.

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5.3 LAND USE, PLANNING, AND RECREATION

5.3.1 Introduction

This section describes existing land uses in the study area and its immediate surroundings, as well as relevant land use policies and regulations within the affected jurisdictions. In addition, this section presents an evaluation of the potential land use impacts that would result from proposed Program implementation and mitigation measures to resolve such potential impacts. Specific construction and operational land use impacts are evaluated in corresponding technical sections.

5.3.2 Existing Conditions

Regional Setting

The study area vicinity (as shown in Figures 4-1 and 4-5 of Chapter 4, Program Description) includes the greater Santa Cruz area, encompassing the city of Santa Cruz, portions of unincorporated Santa Cruz County (Live Oak), and the city of Capitola. Land uses in the vicinity of the study area include residential, commercial, industrial, and agricultural uses. Public uses and parks near the study area include Antonelli's Pond, Moore Creek, the Homeless Garden Project, Natural Bridges State Beach, Schwann Lake, and Arana Gulch. Recreation use areas include sandy beaches along the Pacific Ocean, the San Lorenzo River, redwood forests, parks, community gardens, plazas, trails, the Municipal Wharf, and the Santa Cruz Beach Boardwalk.

Study Area

The study area encompasses the proposed desalination plant areas and the proposed pipeline corridors (see Figures 4-1 and 4-2 of Chapter 4, Program Description). Land uses as designated by the *City of Santa Cruz General Plan* (General Plan) are varied and include residential, commercial, and industrial areas.

To the west, the study area is generally bounded by the Santa Cruz city limit. The UCSC Terrace Point Area borders the western boundary of the city, which is primarily undeveloped. The Pacific Ocean borders the area to the south. The eastern boundary of the study area extends just beyond the western limits of the city of Capitola. Generally, single-family residences dominate the northwestern portion of the study area, with interspersed commercial uses. The southwestern portion of the study area generally consists of industrial uses, large public uses, and single-family residences. Within the central portion of the study area in the community of Live Oak, residential and commercial areas predominate. The portion of the study area located in Capitola generally consists of residential and commercial uses as well as public facilities.

<u>Alternatives D-1 and D-2 (Applicable to both Alternatives)</u>

Desalination Plant Location

Three areas are being considered for the proposed desalination plant: the Industrial Park Area, the Shaffer Road/Antonelli's Pond Area, and the Terrace Point Area. Portions of these areas are within the coastal zone and are therefore subject to the California Coastal Act and the Local Coastal Program permit process. The Coastal Commission defines the coastal zone as a "distinct and valuable natural resource of vital and enduring interest to all the people and exists as a delicately balanced ecosystem" and sets laws for its permanent protection (California Coastal Act 2003). Specifically, the coastal zone extends from the state's three-mile seaward limit (the state-designated point of three miles from sea to coast) to an average of approximately 1,000 yards inland from the mean high tide of the sea. Figure 5.3-1 shows the coastal zone within the city of Santa Cruz. Coastal zone boundaries and regulations are discussed further under the Regulatory Environment section.

Table 5.3-1 describes general land uses and General Plan land use designations within the potential desalination plant areas and their relationship to the coastal zone. A description of each area is provided below.

Table 5.3-1
General Land Uses, General Plan Land Use Designations, and Areas Located in the Coastal Zone within the Proposed Desalination Plant Locations

PROPOSED LOCATION	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Industrial Park Area	Industrial, Undeveloped Parcel	General Industrial	Southern half of the area only
Shaffer Road/Antonelli's Pond Area	Open Space	Single Family Residential, Parks, Floodplain	Yes
Terrace Point Area	Open Space, Offices, Research Facilities	Exclusive Agriculture	Yes

Source: City of Santa Cruz General Plan 1992

Industrial Park Area. The Industrial Park Area is in the southwestern portion of the city of Santa Cruz and is approximately 20 acres in size (see Figures 4-4 and 4-5 in Chapter 4, Program Description). The area is generally bounded by the Southern Pacific Railroad (SPRR) tracks and Mission Street to the north, Natural Bridges Drive to the west, Swift Road to the east, and Delaware Avenue to the south. This privately owned area consists of land partially developed for manufacturing uses, including a Lipton Foods plant and a former Wrigley manufacturing plant, and undeveloped parcels. The majority of the undeveloped portions of the Industrial Park Area have been disked and graded, and the Arroyo Seco Canyon Drainage,[1] which previously passed through the middle of the Industrial Park Area, was realigned in 2001. The entire Industrial Park Area is designated as General Industrial according to the General Plan. The surrounding area includes other industrial uses. Portions of the Industrial Park Area are within the coastal zone and would be subject to the coastal permit process.

[1] The realigned Arroyo Seco Creek is also known as Meder Creek or the Lipton Ditch.

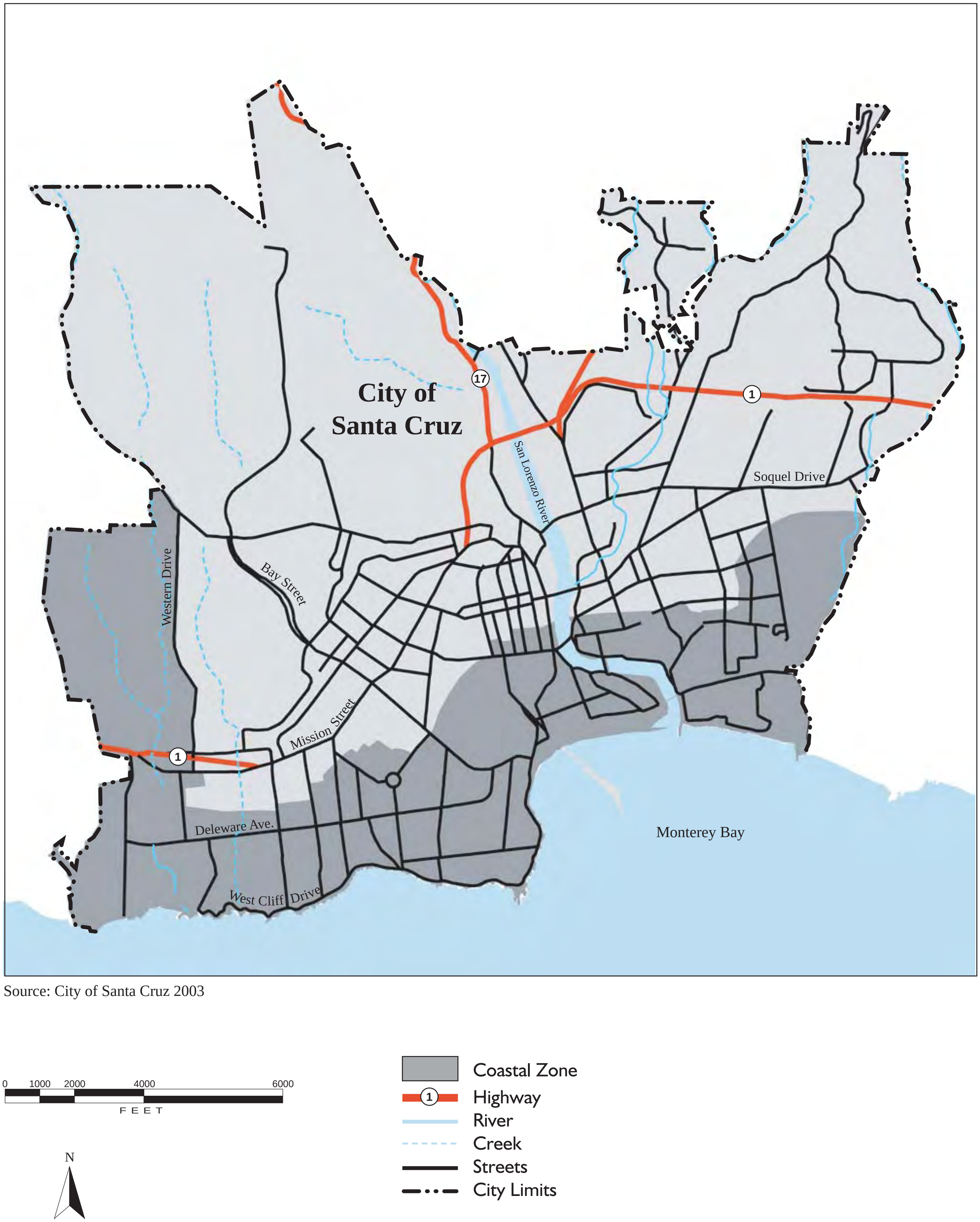

FIGURE 5.3-1

City of Santa Cruz Coastal Zone

There are no recreational uses within the Industrial Park Area; however, Natural Bridges State Park and Derby Park are less than 1,000 feet to the south. Natural Bridges State Park is utilized for public recreation and beach access.[2] The Moore Creek Corridor, located west of the Industrial Park Area, provides passive recreation opportunities.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area (referred to as the Swenson property in the City's General Plan) is between Shaffer Road and Antonelli's Pond in western Santa Cruz (see Figures 4-1 and 4-2 of Chapter 4, Program Description). Delaware Avenue and the Homeless Garden Project (a vegetable and flower garden) bound the property to the south and north, respectively. The approximately 11-acre area is undeveloped and surrounded by undeveloped parcels and residential uses. De Anza Park, a mobile home park, is approximately 200 feet to the south.

The entire Shaffer Road/Antonelli's Pond Area lies within the coastal zone and is designated Single Family Residential, Parks, and Floodplain by the General Plan. This area does not have an adopted Local Coastal Plan, and thus the Coastal Commission does not recognize its residential land use designation. The area is also entirely within the *Moore Creek Corridor Access and Management Plan* area, which identifies policies and actions needed for resource protection and recreation in the Moore Creek corridor.

Within the area, a trail used for walking and biking runs parallel to Antonelli's Pond on the west side. Natural Bridges State Park is directly south of the area, across Delaware Avenue. A bike route runs to the end of Delaware Avenue just past Antonelli's Pond.

Terrace Point Area. The Terrace Point Area abuts on the western boundary of the city of Santa Cruz (see Figures 4-1 and 4-2 in Chapter 4, Program Description). Steep cliffs and the Pacific Ocean border the area to the south. Younger Lagoon Reserve (YLR) borders the area to the west. The SPRR corridor borders the area to the north. Residential use (De Anza mobile home park) is located east of the area. The Terrace Point Area, owned by UCSC, encompasses the approximately 60-acre Terrace Point property (referred to as the Westside Lands in the General Plan), the approximately 16-acre Long Marine Laboratory[3] (LML), and the 24-acre YLR. The Terrace Point Area property consists mostly of open space, but also includes several buildings that house offices and research facilities on the southwestern portion of the property. Wetlands surround the Younger Lagoon to the west. Access is provided via Delaware Avenue. McAllister Way and the Delaware Extension provide internal access within the Terrace Point Area. The General Plan designates the Terrace Point Area as Coastal Dependent and Low-to-Medium Residential. It is zoned as Exclusive Agriculture and was formerly farmed for Brussels sprouts; however, farm operations ceased in 1988. The Terrace Point Area is an area of deferred certification and not recognized by the Coastal Commission as Exclusive Agriculture, or as having a specific land use (Thomas 2004; 2005). The area is neither within nor adjacent to any agricultural lands protected under Williamson Act contracts. The entire Terrace Point Area is within the coastal zone.

[2] The beach area is surrounded by a natural amphitheatre and lagoon with eucalyptus trees and coastal prairie vegetation.

[3] The LML is a key facility of the Institute of Marine Sciences, an interdisciplinary research unit of UCSC.

The LML consists of nonresidential research facilities and undeveloped land in the western and southern portions of the 16-acre LML. Facilities include three permanent buildings, trailers, and outdoor research space, seawater pools, and holding pens.

UCSC owns and manages both the 16-acre LML and the 60-acre Terrace Point property (Marine Science Campus). The development of the Science Campus, including the 24-acre Younger Lagoon, is guided by the UCSC *Marine Science Campus Coastal Long Range Development Plan* (CLRDP).[4] The CLRDP is a physical development and land use plan intended to guide and control future development, land use, and resource protection at the UCSC Marine Science Campus for a 20-year period. It identifies five land uses for the area, including Research and Education Mixed Use, Resource Protection, Resource Protection Buffer, Open Space, and Wildlife Corridor, and sets forth a prototype site plan for the Campus, which is one possibility in achieving the CLRDP concepts and provisions. Guidelines provided in the CLRDP address seven specific areas of design, including building, campus street, parking, public trail, landscape, lighting, and site signage. Certification of the CLRDP by the California Coastal Commission will allow UCSC to make land use decisions regarding project development within its property. Currently, all development projects within the Terrace Point property and Long Marine Science Campus must be reviewed by the Coastal Commission.

Recreation in the Terrace Point Area is limited. There is approximately 800 feet of bluff-top trail at the southern edge of the area. Three public-access vista points in the Terrace Point Area overlook YLR and the ocean. Two of these overlooks are adjacent to YLR and provide visual access into the YLR. The third overlook, at the end of McAllister Way, affords views of the ocean. To protect habitat and biodiversity, access to the YLR area is controlled. Interpretation of the YLR is provided through docent-guided tour programs of the Seymour Marine Discovery Center. Access to the YLR Beach from the coast is made difficult by a rocky intertidal shelf area with promontories extending into the ocean at either end of the beach. The UC Natural Reserve System has restricted beach-going access to the fore-beach and ocean through YLR, with the concurrence of the Coastal Commission. The majority of the Terrace Point Area is open to public access during daylight hours on designated trails. Until the adoption of the CLRDP, public access is guided by the *UCSC Long Marine Lab Campus Interim Access Plan* (adopted on October 16 2000).

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1). The raw water intake pipeline (Corridor 1) is in the city of Santa Cruz and generally traverses industrial and residential uses, with intermittent public uses in the vicinity (see Figures 4-1 and 4-2 in Chapter 4, Program Description). Corridor 1 is generally located along and south of Delaware Avenue and therefore is entirely within the coastal zone. The corridor's designated uses in the General Plan and its relationship to the coastal zone are presented in Table 5.3-2.

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4 The University of California Board of Regents certified the CLRDP EIR and approved the CLRDP on September 21, 2004. The adopted CLRPD supersedes the most recent planning documents for the LML site, including the current Master Plan and Interim Access Plan (UCSC, 2004).

Table 5.3-2
Streets, General Land Uses, General Plan Land Use Designations, and Areas Located in the Coastal Zone Along Pipeline Corridor 1

STREETS LOCATED IN CORRIDOR 1	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Delaware Avenue	Residential/Commercial	Single Family Residential, General Industrial, Parks	yes
Swift Street	Industrial	General Industrial, Public Facilities	yes
Chace Street	Residential	Single Family Residential, Public Facilities	yes
Plateau Avenue	Residential	Single Family Residential	yes
Alta Avenue	Residential	Single Family Residential	yes
Oxford Way	Residential	Single Family Residential	yes
Sunset Avenue	Residential	Single Family Residential	yes
John Street	Residential	Single Family Residential	yes
Getchell Street	Residential	Single Family Residential	yes
Fair Street	Residential	Single Family Residential	yes
Almar Avenue	Residential	Single Family Residential	yes
West Cliff Drive	Residential	Single Family Residential	yes

Source: City of Santa Cruz General Plan 1992

Corridor 1 is primarily industrial along Delaware Avenue and residential south of Delaware Avenue. Schools in the vicinity of Corridor 1 include the Monarch Community School at 313 Swift Street and the Natural Bridges Elementary School at 255 Swift Street (see Figure 4-1 in Chapter 4, Program Description). A multi-use path adjacent to Corridor 1 parallels the coastline adjacent to West Cliff Drive. Beach access is provided at the location of the existing junction structure (see Figures 4-1 and 4-2 in Chapter 4, Program Description).

Junction Structure. The existing junction structure is located on the beach just below the intersection of Sunset Avenue and West Cliff Drive in the city of Santa Cruz. A stairway above the structure that houses the outfall facility provides access to the beach. The junction structure is within the coastal zone. A multi-use path (Pacific Coast Bicycle Route) runs along the coast adjacent to West Cliff Drive.

Treated Water Distribution Pipeline (Corridor 2). Within the city of Santa Cruz, the treated water distribution pipeline (Corridor 2) generally traverses residential uses, with intermittent public and park uses in the vicinity (see Figures 4-1 and 4-2 in Chapter 4, Program Description). Table 5.3-3 shows the general land uses of the streets in Corridor 2 and their relationship to the coastal zone. The designated General Plan uses for Corridor 2 include Single and Multiple Family Residential. The area west of Western Avenue is within the coastal zone.

Table 5.3-3
Streets, General Land Uses, General Plan Land Use Designations, and Areas Located in the Coastal Zone Along Pipeline Corridor 2

STREETS LOCATED IN CORRIDOR 2	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Cardiff Place	Residential/Commercial	Single Family Residential	--
Cardiff Court	Residential	Multiple Family Residential	--
Bay Street	Residential, Creek	Single Family Residential	--
Meder Street	Residential, Dense Residential, Open-Space, Park, Cemetery	Single Family Residential, Multiple Family Residential	--
Western Avenue	Residential, Open Space	Single Family Residential, Multiple Family Residential	yes
Cardiff Place	Residential/Commercial	Single Family Residential	--

Source: City of Santa Cruz General Plan 1992
-- = *Not within the Coastal Zone*

There are no schools in the vicinity of Corridor 2. Recreation facilities include the University Terrace Park on Meder Street, which consists of a tennis court, a basketball court, a playground, and open space areas. The Home of Peace Cemetery is directly west of the park.

Treated Water Distribution Pipeline (Corridor 3). The treated water distribution pipeline (Corridor 3), located in the city of Santa Cruz, generally traverses industrial and residential uses, with intermittent public uses in the vicinity (see Figures 4-1 and 4-2 in Chapter 4, Program Description). Table 5.3-4 shows the streets, general land uses, General Plan land use designations, and areas within the coastal zone along Corridor 3. Uses along Corridor 3 are designated in the General Plan as Single Family Residential, Community Commercial, Public Facilities, and General Industrial. Portions of Corridor 3 (Delaware Avenue and Swift Street) are within the coastal zone.

Public facilities in the vicinity of Corridor 3 include the Bay View Elementary School at 1231 Bay Street and City of Santa Cruz Fire Station Number 3 at 335 Younglove Avenue. Recreation areas within Corridor 3 include Natural Bridges State Beach.

Concentrate Discharge Pipeline (Corridors 1 and 4). The concentrate discharge pipeline (Corridors 1 and 4), located in the city of Santa Cruz, generally traverses industrial and residential uses, with intermittent public and park uses in the vicinity (see Figures 4-5 and 4-6 in Chapter 4, Program Description). There are two optional routes for the concentrate discharge pipeline; Corridor 1 is described under the raw water intake pipeline, above, and Corridor 4 follows Delaware Avenue east to the WWTP. Uses along the corridor are primarily residential and are designated in the General Plan as Single Family Residential, Parks, and General Industrial, as shown in Table 5.3-5. Corridor 4 is entirely within the coastal zone.

Table 5.3-4
Streets, General Land Uses, General Plan Land Use Designations, and Areas Located in the Coastal Zone Along Pipeline Corridor 3

STREETS LOCATED IN CORRIDOR 3	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Iowa Drive	Residential	Single Family Residential	--
Cardiff Place	Residential/Commercial	Multiple Family Residential	--
Berkshire Avenue	Residential	Single Family Residential	--
Baldwin Street	Residential	Single Family Residential	--
Bay Drive	Residential	Single Family Residential	--
Bay Street	Residential, Creek	Single Family Residential	--
Las Ondas Court	Residential	Single Family Residential	--
Escalona Court	Residential	Single Family Residential	--
Escalona Drive	Residential	Single Family Residential	--
Anthony Street	Residential	Single Family Residential	--
Kenneth Street	Residential	Single Family Residential	--
Olive Street	Residential	Single Family Residential	--
King Street	Residential	Single Family Residential	--
Mesa Lane	Residential	Single Family Residential	--
Mission Street	Industrial, Commercial	Community Commercial	--
Swift Street	Industrial	General Industrial, Public Facilities	yes
Delaware Avenue	Residential/Commercial	General Industrial	yes

Source: City of Santa Cruz General Plan 1992

-- = Not within the Coastal Zone

Table 5.3-5
Streets, General Land Uses, General Plan Land Use Designations, and Areas Located in the Coastal Zone Along Pipeline Corridor 4

STREETS LOCATED IN CORRIDOR 4	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Delaware Avenue	Residential/ Commercial	Low Density Housing, General Industrial, Parks	yes
Columbia Street	Residential	Single Family Residential	yes
National Street	Residential	Single Family Residential	yes
Centennial Street	Residential	Single Family Residential	yes
Liberty Street	Residential	Single Family Residential	yes
Laguna Street	Residential	Single Family Residential	yes
Monterey Street	Residential	Single Family Residential	yes
Santa Cruz Street	Residential	Single Family Residential	yes
Gharkey Street	Residential	Single Family Residential	yes
Bay Street	Residential	Single Family Residential	yes

Source: City of Santa Cruz General Plan 1992

Schools in the vicinity of Corridor 4 include the Monarch Community School at 313 Swift Street and the Natural Bridges Elementary School at 255 Swift Street. Recreation areas within Corridor 4 include Natural Bridges State Beach, which is utilized for public recreation and beach access, and Bethany Curve Park, located on Delaware Avenue east of Almar Avenue, which also provides beach access.

<u>Alternative D-2 (Applicable to this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7)

In addition to the facilities described above, Alternative D-2 also includes the D-2 distribution pipelines (Corridors 5, 6, and 7), which would generally traverse commercial and residential uses in the city of Santa Cruz, the community of Live Oak, and the city of Capitola (see Figures 4-12 and 4-13 in Chapter 4, Program Description); intermittent public and park uses are located in the vicinity of the corridor. These corridors extend east from the vicinity of Ocean Street in Santa Cruz to just beyond the western city limits of Capitola. The uses along these corridors are designated in the *Santa Cruz County General Plan*, the *City of Santa Cruz General Plan*, and the *City of Capitola General Plan* as Single Family Residential, Parks, General Industrial, Residential-Commercial, and Public Facilities (see Table 5.3-6). Corridors 5 and 6 are not within the coastal zone. Corridor 7 is entirely within the coastal zone and is also located primarily along a railroad right-of-way.

Table 5.3-6
Streets, General Land Uses, General Plan Land Use Designations, and Areas Located in the Coastal Zone Along Pipeline Corridors 5, 6, and 7

STREETS LOCATED IN CORRIDOR 5	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Soquel Avenue	Residential, Parks	Single Family Residential	--
STREETS LOCATED IN CORRIDOR 6	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Soquel Avenue	Residential	Single Family Residential	--
Capitola Avenue	Commercial, Residential	Commercial, Residential, Community Facilities	--
STREETS LOCATED IN CORRIDOR 7	GENERAL LAND USES	GENERAL PLAN LAND USE DESIGNATION	LOCATED WITHIN THE COASTAL ZONE
Ocean Street	Residential	Multiple Residence Medium Rise	yes
East Cliff Drive	Residential	Multiple Family Residential, Single Family Residential	yes
Murray Street	Residential, Industrial	Single Family Residential, Public Facilities, General Industrial,	yes
Railroad Right-of-Way	Residential, Parks, Commercial	Commercial, Residential, Parks and Open Space	yes
41st Avenue	Commercial	Commercial	yes

Source: Santa Cruz County General Plan 1994; City of Santa Cruz General Plan 1992; City of Capitola General Plan 1989
-- = Not within Coastal Zone

Figure 4-6 identifies schools in the vicinity of the corridors. The Branciforte Elementary School is adjacent to Corridor 5 (840 North Branciforte Avenue). Live Oak Elementary School (1916 Capitola Road) is adjacent to Corridor 6. Other schools near these corridors include Branciforte Junior High School (315 Poplar Street), Green Acres Elementary School (966 Bostwick Street), Tierra Pacifica Charter School (1916 Capitola Road), and Shoreline Middle School (855 17th Avenue). Recreation areas in the vicinity of Corridors 5, 6, and 7 include the Twin Lakes State Beach and Schwann Lake, south of Corridor 7.

5.3.3 Regulatory Framework

Project Consistency with Planning and Zoning Designations

The land use designations of the proposed desalination areas are described above. The Industrial Park Area is designated by the General Plan as General Industrial. The General Plan designates the Shaffer Road/Antonelli's Pond Area as Single Family Residential, Parks, and Floodplain, although the Coastal Commission does not recognize this designation. The General Plan designates the Terrace Point Area as Exclusive Agriculture, although the Coastal Commission does not recognize this designation. In addition, the Coastal Commission will not recognize the land uses of the Office of the Regent-approved CLRDP until the Commission's certification of the Plan. Construction of the desalination plant at the Shaffer Road/Antonelli's Pond Area or the Terrace Point Area would not be consistent with existing land use designations.

California Coastal Act

Portions of the study area are within the coastal zone of the city of Santa Cruz. All development within the coastal zone is governed by the provisions of the California Coastal Act, which was enacted by the state legislature in 1976 to provide long-term protection of California's 1,100-mile coastline for the benefit of current and future generations (California Coastal Act 2003). Sections of the act relevant to the proposed Program are described below.

<u>Development</u>

Section 30106 of the California Coastal Act requires a coastal development permit for development defined as "on land, in or under water, the placement of any solid material or structure; discharge or disposal of any dredged material or of any gaseous, liquid, solid, or thermal waste…or construction, reconstruction, demolition, or alteration of the size of any structure, including any facilities of any private, public or municipal utility." This permit can be obtained at the local level from cities that adopt a Local Coastal Program. Proposed construction within the coastal zone would therefore fall under the jurisdiction of the City of Santa Cruz, Santa Cruz County, and the City of Capitola Local Coastal Program, as described below. The Coastal Commission retains permanent coastal permit jurisdiction over development proposed on the immediate shoreline (tidelands, submerged lands, and public trust lands). Therefore, the local agencies as well as the Coastal Commission would require a development permit.

Coastal Act Section 30250 requires that new development be located within, contiguous with, or in close proximity to existing developed areas able to accommodate it. The proposed Program facilities would primarily be located within the city limits of Santa Cruz and amongst existing urban uses.

Coastal Act Priority Uses

Coastal Act Section 30255 gives priority to coastal-dependent uses over other developments and indicates that coastal-related developments should be accommodated within reasonable proximity to the coastal-dependent uses they support. As defined in the Coastal Act, coastal-dependent development or uses means "any development or use which requires a site on, or adjacent to, the sea to be able to function at all." Coastal-related development is defined as "any uses that are dependent on a coastal-dependent development or use."

Public Access/Recreation

Coastal Act Sections 30211 and 30212 require that new development not interfere with the public's right to coastal access, and that new development provide public access except where it would be inconsistent with public safety, security, or protection of fragile resources. Section 30221 calls for protection of oceanfront land suitable for recreational uses. Any activities at the beach near West Cliff Drive and Sunset Avenue would be subject to limitations set forth by the coastal development permit in accordance with the California Coastal Act.

Agricultural Land Protection and Stable Urban/Rural Boundaries

Coastal Act Section 30241 seeks to maintain the maximum amount of prime agriculture land in production and to minimize conflicts between agricultural and urban land uses.

Agricultural Land Designations

In 1984, the California Department of Conservation prepared a statewide inventory of important farmlands. This mapping system includes eight categories: prime farmland, farmland of statewide importance, unique farmland, farmland of local importance, grazing land/urban land, other land, and land committed to nonagricultural uses. According to the inventory, the project site contains "unique farmlands," which means land of lesser quality soils used for the production of the state's leading agricultural cash crops. The Terrace Point Area is generally bordered to the west by designated prime farmland and farmland of statewide importance.

City of Santa Cruz General Plan and Local Coastal Program

The General Plan was adopted in 1992 and contains goals, policies, and implementation measures that provide planning guidance for the future. Currently, the General Plan is in the process of being updated. The Land Use Element of the General Plan designates land uses within the city and includes a discussion of current land uses, goals, and policies for the future. The policies contained in the Land Use Element that apply to the proposed Program are provided in Appendix B of this document. Specifically, these policies relate to the development of the Terrace Point property and the Swenson property.

The City of Santa Cruz has prepared and adopted its Local Coastal Program as a part of the General Plan. The Program is composed of a land use plan, implementing ordinances, and maps applicable to the coastal zone portions of the city for the purpose of preserving unique coastal resources pursuant to the requirements of the California Coastal Act.

City of Santa Cruz Moore Creek Corridor Access and Management Plan

Moore Creek is an intermittent stream that lies at the western boundary of the city of Santa Cruz. It commences at the UCSC campus and flows into a coastal lagoon at Natural Bridges State Park. Its largely undeveloped watershed is considered an important wildlife corridor and ecological link between the open lands of the university and Natural Bridges State Park. The *Moore Creek Corridor Access and Management Plan* was developed to provide the policy and action plan necessary to ensure the protection of the Moore Creek corridor, a unique natural area, while making it more accessible to passive recreational uses. The policies contained in the Land Use Element of the *Moore Creek Corridor Access and Management Plan* that apply to the proposed Program are provided in Appendix B of this document.

Santa Cruz County General Plan and Local Coastal Program

The Santa Cruz County General Plan and Local Coastal Program, adopted in 1994, is a comprehensive, long-term planning document for the unincorporated areas of the county. The Land Use Element of the *Santa Cruz County General Plan and Local Coastal Program* guides the future physical development of Santa Cruz County and addresses historic, current, and future distribution, location, density, and intensity of land uses in the unincorporated portion of the county. No land use policies in the *Santa Cruz County General Plan and Local Coastal Program* are applicable to the proposed Program.

City of Capitola General Plan

The *City of Capitola General Plan,* adopted in 1989, is a blueprint for future development within the community. The Land Use Element of the *City of Capitola General Plan* designates land uses within the city and includes a discussion of current land uses, goals, and policies for the future. The Land Use Element contains a goal and policy relating to compatibility of new development with existing uses; this goal and policy apply to the proposed Program and are provided in Appendix B.

City of Capitola Local Coastal Program

Because the majority of the land in Capitola is within the coastal zone, Capitola was required to develop and adopt a Local Coastal Program to address the specific requirements of the California Coastal Act. Under mandate from the Coastal Commission, the City of Capitola adopted a program in 1981 and revised it in 1989. Although the *City of Capitola Local Coastal Program* is independent of the *City of Capitola General Plan*, policies and programs from the program have been incorporated into the General Plan. No land use policies in the *City of Capitola Local Coastal Program* relate to development of public utility infrastructure.

UCSC Marine Science Campus Coastal Long Range Development Plan

As described above, the CLRDP was approved by the University of California Office of the Regents on September 21, 2004. The CLRDP has not yet been certified by the California Coastal Commission. The CLRDP is a comprehensive physical development and land use plan that governs development, land use, and resource protection at the UCSC Marine Science Campus (Terrace Point Area, LML, and YLR). The CLRDP sets forth procedures for approving development on the Marine Science Campus consistent with California Coastal Commission Regulations and standing procedures used by the University of California. Specifically, upon certification by the California Coastal Commission, it would delegate to the University of California the authority to undertake or authorize any development project consistent with the plan without a coastal development permit. However, the California Coastal Commission would retain the authority to review development approvals issued by the University of California. Until the Plan is approved, the Coastal Commission would evaluate and approve projects at the site on a case-by-case basis.

Institute of Marine Sciences Long Marine Laboratory Master Plan

The 16-acre Institute of Marine Sciences LML consists of nonresidential research facilities and undeveloped land. Development in this area is guided by the *Long Marine Laboratory Master Plan*.[5] The Master Plan provides guidelines for the expansion of the LML under two scenarios. This document could be superseded by the CLRDP once that document has been adopted.

State Lands Commission

The State Lands Commission (SLC) manages 4.5 million acres of land held in trust for Californians. The jurisdiction of the SLC includes a three-mile-wide section of tidal and submerged land adjacent to the coast and offshore islands, including bays, estuaries, and lagoons. It also includes the waters and underlying beds of more than 120 rivers, lakes, streams, and sloughs. The state holds these lands for the public trust purposes of water-related commerce, navigation, fisheries, recreation, and open space.

The SLC is responsible for granting dredging permits and issuing land use leases. In addition, the SLC is responsible for regulating the use of tidelands and submerged lands under its jurisdiction to ensure that proposed uses of these lands are consistent with a public purpose.

5.3.4 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, and in accordance with Appendix G of the *CEQA Guidelines*, an impact to land use would be considered significant if it would:

- Conflict with surrounding uses in the project vicinity based on environmental impacts (e.g., land use disturbance from increased dust);

[5] The Terrace Point property is not guided by this planning document.

- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect;
- Conflict with established recreational uses of an area;
- Result in conversion of agricultural land to nonagricultural use or impair the agricultural productivity of prime agricultural land;
- Preclude future development;
- Physically divide an established community; or
- Conflict with any applicable habitat conservation plan or natural community conservation plan.

The proposed Program components would not disrupt or divide any established land use. The desalination plant would be located on parcels within or near to other industrial uses, and conveyance facilities would be buried underground. In addition, the proposed Program is not in an area covered by a habitat conservation plan or natural community conservation plan. Therefore, these issues are not discussed further.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Expansion of the desalination plant is not anticipated to require additional facilities outside the 2.5-mgd plant footprint and the facilities that are required have not yet been identified. If additional facilities are determined to be necessary at the time of the expansion, such facilities would be appropriately evaluated. Table 5.3-7 summarizes potentially significant impacts.

Table 5.3-7
Summary of Potential Impacts – Land Use, Planning, and Recreation

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITY		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD /ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.3-1: Construction and operational impacts to adjacent land uses.	◐	◐	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.3-2: Conflict with existing land use designations and goals, policies, and programs of affected jurisdictions.	◐	◐	--	--	◐	◐	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.3-3: Impairment of recreation facilities and activities.	◐	◐	--	--	◐	◐	○	○	○	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.3-4: Program operation could result in conversion of agricultural lands to nonagricultural uses.	○	○	○	○	--	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.3-5: Preclude future development at the selected desalination area.	◐	◐	--	--	○	○	◐	◐	◐	○	○	○	○	○	○	○	○

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

[2]Impacts associated with the specific facilities of the desalination plant.

Impacts and Mitigation

Impact 5.3-1: The proposed Program would result in short-term disturbance to adjacent land uses (including residences) from construction noise, an increase in dust, and the restriction of traffic flow. Operation of the proposed Program would result in long-term disturbance to adjacent land uses from the generation of noise, change in the visual character, and use, storage, and delivery of hazardous materials. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

The Program proposes to construct and operate a desalination facility within an area surrounded by industrial, residential, commercial and open space uses. Potential disturbance or effects would include, but would not be limited to, the following: increases in noise and dust, traffic flow restrictions, safety hazards, and alteration of the visual environment. Construction of the desalination plant would result in short-term construction impacts, which would be mitigated by measures identified in the sections listed below. Operation of the proposed desalination plant would generate noise during the operation of the pump station, create visual impacts due to the siting of a public facility, and pose safety hazards to adjacent land uses, such as the residences at the De Anza mobile home park. Construction and operation impacts and mitigation measures are discussed in detail in Section 5.5, Noise; Section 5.6, Air Quality; Section 5.10, Visual Resources; Section 5.11, Hazards and Hazardous Materials; and Section 5.12, Traffic and Transportation.

Conveyance and Pumping Facilities

The Program proposes to construct and operate conveyance and pumping facilities adjacent to a variety of land uses, including industrial, commercial, residential, parks, open space, and creeks. Potential land use disturbances would include, but would not be limited to, the following: increases in noise and dust, traffic flow restrictions, safety hazards, and conflicts with public services and utilities that would affect land uses, such as residences or schools adjacent to proposed work sites (Corridor 1 is adjacent to the Monarch Community School). Construction activities would result in short-term impacts that would be mitigated by measures identified in other sections. Operation of the pipelines would not result in long-term effects, as the pipelines would be located underground. Operation of the proposed pumping facilities could result in long-term effects. Construction and operation impacts and mitigation measures are discussed in detail in Section 5.5, Noise; Section 5.6, Air Quality; Section 5.9, Public Services and Utilities; Section 5.11, Hazards and Hazardous Materials; and Section 5.12, Traffic and Transportation.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7)

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7). Land use impacts associated with the construction and operation of proposed conveyance and pumping facilities would include short-term disturbance to adjacent land uses, including residences and schools (Corridors 5 and 7 are near the Branciforte Elementary School, and Corridor 6 is adjacent to the Live Oak Elementary School). These conflicts include increased dust, noise, or traffic delays. Mitigation measures provided in other sections would reduce such impacts. Please refer to Section 5.5, Noise; Section 5.6, Air Quality; Section 5.9, Public Services and Utilities; Section 5.11, Hazards and Hazardous Materials; and Section 5.12, Traffic and Transportation.

Mitigation Measures

Please refer to Section 5.5, Noise; Section 5.6, Air Quality; Section 5.9, Public Services and Utilities; Section 5.11, Hazards and Hazardous Materials; and Section 5.12, Traffic and Transportation for mitigation measures to reduce land use impacts.

Significance After Mitigation: Less than Significant.

⌧ **Impact 5.3-2: Implementation of the proposed Program could conflict with existing goals, policies, and programs of affected jurisdictions adopted for the purpose of avoiding or mitigating an environmental effect, as well as land use designations specified in relevant General Plans. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to both Alternatives)

The affected jurisdictions, including the City of Santa Cruz, Santa Cruz County, and the City of Capitola, have policies and guidelines that guide development within their boundaries for the protection of environmental resources. Appendix B presents goals and policies from general plans governing land use planning in the study area. Some local policies (e.g., noise ordinances) are used as significance criteria in this EIR and consequently are discussed in relevant sections of this chapter. With mitigation measures proposed by the City of Santa Cruz, the proposed Program generally conforms to General Plan policies.

In addition, the City would also be required to conform to the policies of the regulatory agencies, including, but not limited to, the California Coastal Commission, State Lands Commission, U.S. Army Corps of Engineers, and California Department of Fish and Game. These agencies would require permits for facility development within their jurisdictions and prior to Program construction. Other sections of Chapter 5 describe permit requirements for relevant Program components and their potential impacts. This discussion evaluates the consistency of the proposed Program with relevant policies.

Alternatives D-1 and D-2 (Applicable to the First Increment of Both Alternatives)

Raw Water Intake System

The raw water intake would be converted from an existing abandoned wastewater outfall. The conversion would not conflict with existing goals, policies, and programs of affected jurisdictions as long as appropriate permits are obtained from the pertinent entities, including but not limited to the State Lands Commission and the Coastal Commission.

Desalination Plant Location

The desalination plant would be located at one of the three proposed desalination areas. The City of Santa Cruz establishes design policies that are intended to protect sensitive resources (e.g., waterways, archaeological resources, and biological resources) as well as reduce potential safety hazards to people and structures. Other policies promote or encourage certain orderly development (e.g., bike paths). In addition, the plans outline land use policies for specific properties (e.g., Specific Plan requirement). The proposed Program would generally conform to these goals and policies. Exceptions relate to conformance with land use designations as described below.

Industrial Park Area. The Industrial Park Area is designated by the *City of Santa Cruz General Plan* as General Industrial. As a water production facility, the proposed desalination plant would be considered a public facility that would be compatible with the designation of the Industrial Park Area as well as surrounding industrial uses.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is designated by the *City of Santa Cruz General Plan* as Single Family Residential, Parks, and Floodplain. The City allows development of a public facility within this land use designation if a special use permit is acquired from the Planning Department (Rebagliati 2004). As discussed in the Setting section, the Coastal Commission does not recognize the Swenson parcel for its designated land use, and thus the property cannot be developed until appropriate resource constraints have been identified and a development plan has been prepared (Rebagliati 2004). Policy L2.2.5 of the *General Plan and Local Coastal Program* (Land Use Element) requires development of a Specific Plan for the 11-acre Swenson parcel. Approval of the Specific Plan as part of the Local Coastal Program by both the City and the Coastal Commission would therefore permit development of this area, based on the zoning proposed in the Specific Plan (Rebagliati 2004). A Specific Plan for the area is not currently being developed. Therefore, if the City proposes to locate the desalination plant at this property, it would be required to prepare a Specific Plan for the entire Swenson parcel, even though the desalination facility would take up no more than 3 acres of the 11-acre property. The Specific Plan would include proposed development areas and resource protection to ensure the maintenance of a wildlife corridor between Antonelli's Pond and Younger Lagoon (Rebagliati 2004).

Terrace Point Area. The Terrace Point Area is designated by the *City of Santa Cruz General Plan* as Exclusive Agriculture. As described in the Setting section, agricultural operations ceased in 1988. The CLRDP identifies five land uses, excluding agriculture, within the Marine Science Campus. Because the CLRDP has not been certified by the Coastal Commission, this area does not have a specific land use, and thus is considered under the Coastal Commission deferred certification status (Thomas 2004; 2005). Until the Plan is approved, the Coastal Commission would evaluate and approve projects at the site on a case-by-case basis. Although it is now known when the Coastal Commission will certify the CLRDP, assuming that the Commission certifies the Plan, the CLRPD would likely have to be revised to include the facility[7] and the Office of the Regents and the Coastal Commission would have to adopt the revised Plan before such a facility would be allowed on the site. In all cases, the proposed Program would be required to conform with the design guidelines of the CLRDP and obtain a coastal permit prior to its development.

Conveyance and Pumping Facilities

Conveyance facilities would be located underground with other utilities; therefore, their location would not conflict with existing land uses or goals, policies, and programs of affected jurisdictions as long as appropriate encroachment permits are obtained. The pumping facility would be located either

[7] The CLRDP discusses the possibility of a desalination plant but does not identify one in the Plan itself.

within the existing junction structure or as a stand-alone structure adjacent to the junction structure. As the facility would be located adjacent to a similar public use, it would not conflict with existing land uses. Potential policy and land use conflicts with respect to recreational facilities are described in Impact 5.3-3, below. The construction of the proposed facilities could result in temporary closure of recreational facilities in the city of Santa Cruz, which would conflict with the *City of Santa Cruz Local Coastal Program* (Policy 10) and the *Santa Cruz County General Plan and Local Coastal Program* (Policies 7.7a, 7.7b, and 7.7c). These policies are intended to ensure public access to coastal recreation. Alternative access would be provided such that recreational access is not permanently impaired (see Impact 5.3-3).

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. The proposed pipeline would be located underground with other utilities; therefore, its location would not conflict with existing land uses or goals, policies, and programs of affected jurisdictions as long as appropriate encroachment permits are obtained. The proposed pumping facility for the D-2 pipelines has not yet been sited, but would be located and built in such a manner that would not conflict with existing land uses or goals, policies, and programs of affected jurisdictions. Compliance with permit conditions and established standards (e.g., noise) of affected jurisdictions would reduce potential impacts.

Mitigation Measures

Mitigation Measure 5.3-2a: This mitigation measure applies to all proposed Program components. The City shall acquire and conform to conditions of relevant permits of affected jurisdictions, including but not limited to the City of Santa Cruz, Santa Clara County, the City of Capitola, State Lands Commission, and the Coastal Commission.

Mitigation Measure 5.3-2b: This mitigation measure applies to the desalination plant if it is sited at the Antonelli's Pond/Shaffer Road area. The City shall prepare a Specific Plan for Swenson property and obtain approval from both the City of Santa Cruz and Coastal Commission prior to development of the site.

Mitigation Measure 5.3-2c: This mitigation measure applies to the desalination plant if it is sited at the Terrace Point area. The City shall coordinate with UCSC in the siting of the plant, such that it would conform to the CLRDP.

Significance After Mitigation: Less than Significant.

☒ **Impact 5.3-3: The proposed Program would impair recreation facilities and activities from construction activities. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Raw Water Intake

Ocean construction could present a danger to open-ocean kayakers, recreational boaters, recreational fishermen, and scuba divers in the area. Construction staging would likely occur on a barge. Construction activities within the open ocean would require relevant permits from the Corps. As part of the permit process, the U.S. Coast Guard (whose interest is in navigational safety) consults with the Corps. The permit may include conditions that would ensure navigational safety, such as coordination with the U.S. Coast Guard regarding the timing and duration of construction activities. The City would implement such conditions as part of the proposed Program.

Desalination Plant

The three-acre plant would be located on unoccupied parcels outside of recreational areas. The nearest recreational facility is the trail west of Antonelli's Pond and Moore Creek and adjacent to the Schaffer Road/Antonelli's Pond site. As described in the Environmental Quality Element of the General Plan, the construction setback from Moore Creek is required to be at least 100 feet (see Section 5.4, Biological Resources). Therefore, the trail parallel to Moore Creek would not be impacted during construction activities. Construction and operation of the facility would avoid impacts to recreation.

Conveyance and Pumping Facilities

Pipeline construction could temporarily restrict access to recreation areas such as Natural Bridges State Beach and the trail adjacent to Antonelli's Pond (Corridors 1, 2, 3, or 4), University Terrace Park (Corridor 2), and Bethany Curve Park (Corridor 4). Construction activities would be sited or scheduled so as not to affect more than one access at any given time. If a temporary closure is required, appropriate signage would be posted notifying the public of the closure and indicating alternate routes. Construction of the proposed intake pumping facility at the juncture structure as well as construction of the raw water intake and concentrate discharge pipelines (Corridor 1) would require temporary closure of the stairway to the beach near the intersection of West Cliff Drive and Sunset Avenue. Such construction could also affect use of the Pacific Coast bicycle route along West Cliff Drive. To ensure compliance with the Coastal Act with respect to coastal access, alternative beach access would be provided. In addition, bicyclists and other recreationists could be detoured onto adjacent streets during construction activities to ensure public safety.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Construction of the Alternative D-2 pipeline could result in temporary closure of access points to recreational facilities, such as access to the northern area of Schwann Lake (south of Corridor 7). Construction would not affect more than one access to the lake at any given time, and appropriate signage would be posted notifying the public of temporary closures.

Mitigation Measures

Mitigation Measure 5.3-3a: This mitigation measure applies to all proposed Program components. If Program facilities are located adjacent to parks or other recreational facilities, the City shall keep alternative access areas open and post signage to inform the public about temporary access closures. To the extent feasible, the City shall site Program facilities in a way that does not impair recreational uses.

Mitigation Measure 5.3-3b: This mitigation measure applies to the raw water intake pumping facility and, potentially, the raw water intake or concentrate discharge pipeline (Corridor 4). The City shall provide alternative access east of the beach near the intersection of West Cliff Drive and Sunset Avenue to ensure maintenance of beach access. Construction areas would be appropriately fenced and equipment would be stored within the fence zone to provide safety to recreationists. The City shall minimize closure of the beach surrounding the junction structure site.

Mitigation Measure 5.3-3c: The City shall restore the stairway to the beach at West Cliff Drive and Sunset Avenue subsequent to construction activities such that short-term recreation effects would not result in long-term impacts.

Mitigation Measure 5.3-3d: This mitigation measure applies to the raw water intake facility. The City shall acquire regulatory permits from the Corps. As part of the permit process, the City would notify the Coast Guard of impending activities that could affect ocean navigation. The City shall comply with conditions of the permits, including any measures associated with protection of open-ocean recreation activities. The City or its contractors shall post signage at local scuba shops, other recreation equipment rental shops, and fishing stores describing construction activities, duration, contact person, and other relevant information regarding construction of the raw water intake.

Significance After Mitigation: Less than Significant.

Impact 5.3-4: Program operation could result in conversion of agricultural lands to nonagricultural uses. Less than Significant.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

As described above, the Terrace Point Area is designated as Exclusive Agriculture. This designation is not recognized by the Coastal Commission, and no agricultural operations currently take place at this site. UCSC prepared the CLRDP for the Terrace Point Area. Although the CLRDP has not yet been adopted, siting of the proposed desalination plant in conformance with the CLRDP would ensure that potential effects to agricultural lands would not occur. The other desalination sites, pipeline corridors, and pumping sites are considered urban; therefore, no impacts to agricultural resources would occur.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. These facilities would be located in urban areas. Therefore, no impacts to agricultural uses would occur.

Mitigation Measures: None required.

Impact 5.3-5: Development of the desalination plant would preclude future development at the selected area. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

The three-acre desalination plant would be located at one of three desalination areas. All of these areas include large, undeveloped parcels. The facility may be sited in a manner that reduces future development potential (e.g., if it is located in the middle of an undeveloped parcel). The facility would be sited to allow maximum space for future development, while minimizing potential impacts to sensitive resources.

Mitigation Measures

Mitigation Measure 5.3-5a: This mitigation measure applies to the desalination plant component. The City shall construct the plant at the edge of the selected property to the extent feasible (to maximize the space available for future development), while avoiding or reducing impacts to sensitive resources.

Mitigation Measure 5.3-5b: This mitigation measure applies to the desalination plant component if it is located at the Terrace Point Area. The City shall coordinate with UCSC if the facility is sited at the Terrace Point Area such that future development of UCSC facilities would not be precluded.

Significance After Mitigation: Less than Significant.

REFERENCES

California Coastal Act. January 2003. *Public Resources Code Division 20*.

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5.4 BIOLOGICAL RESOURCES

5.4.1 Introduction

This section describes biological resources (i.e., terrestrial wildlife, trees, and plants) that occur or could occur in the study area and the regulations protecting sensitive biological resources. The locations and characteristics of the proposed Program components are also described. The potential impacts to biological resources from implementation of the proposed Program are defined, and mitigation measures are provided to reduce potential impacts. Impacts to marine-related biological resources are discussed in Section 5.2, Marine Resources.

5.4.2 Existing Conditions

Study Methodology

This section incorporates findings from a review and assessment of existing documents including CDFG's California Natural Diversity Database (CNDDB); the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants; *City-Wide Creeks and Wetlands Management Plan* (Biotic Resources Group, 2002); and other biological studies prepared for the proposed Program area.

The CNDDB was searched for sensitive plant communities and special-status plant and wildlife species known to inhabit the study area or its vicinity. Table 5.4-1 lists sensitive plant communities and habitats and special-status species that could potentially occur, based on information generated from the database records, field surveys, and from expert knowledge of biological resources in the study area vicinity. The list includes observed plant and wildlife species, as well as plant communities and habitats that could support special-status species.

Jurisdictional wetlands were also identified based on the occurrence of hydrophytic vegetation,[1] hydric soils, and wetland hydrology within the proposed construction area.

Regional Setting

The proposed Program would be implemented in Santa Cruz County (see Figure 3-1 in Chapter 3, Background), within the Santa Cruz and Soquel U.S. Geological Survey (USGS) 7.5-inch quadrangles. The general vicinity includes urban uses (residential, commercial, and industrial areas, with scattered neighborhood parks), as well as open grasslands, riparian corridors, and hillsides.

Study Area

The study area is bounded by Younger Lagoon to the west and Soquel Creek to the east. Figures 4-1 and 4-5 in Chapter 4, Program Description, show the location of the proposed components. Figure 5.1-1 in Section 5.1, Hydrology and Water Quality, shows sensitive surface water resources in the area: Younger Lagoon, Antonelli's Pond, San Lorenzo River, Branciforte Creek, Arana Gulch,

[1] Hydrophytic vegetation refers to species identified as wetland indicators by the USFWS (Reed 1988).

Rodeo Gulch, Soquel Creek, and Twin Lakes. Section 5.1 discusses these drainages and potential impacts resulting from the proposed Program.

Habitats

Different habitat types (as defined by Holland 1986) occur within the proposed Program area, including, but not limited to, non-native grassland, coast live oak riparian woodland, northern coastal scrub, coastal freshwater marsh, coastal prairie, and central coast arroyo-willow-riparian forest (which is designated as a habitat of special concern by CDFG). Habitat types occurring within the study area are described below.

Non-native Grassland

Non-native grassland is a dominant plant community throughout the potential desalination plant locations, especially the Industrial Park Area, and along the pipeline corridors. This community is composed primarily of weedy, non-native species and is characteristic of highly disturbed areas. Dominant non-native annual grasses within this community include Italian ryegrass (*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), annual fescue (*Vulpia bromoides*), slender wild oat (*Avena barbata*), and hare barley (*Hordeum murinum* ssp. *leporinum*). Associated broadleaved species include wild radish (*Raphanus sativa*), cut-leaved geranium (*Geranium dissectum*), and bristly ox-tongue (*Picris echioides*). Scattered patches of coyote brush (*Baccharis pilularis*) and false willow (*Baccharis douglasii*) also occur in non-native grassland.

Riparian and Wetland Habitats

Due to the presence of water, wetlands and riparian (streamside) areas are characterized by high species diversity. Riparian vegetation has a high structural complexity (i.e., trees, shrubs, ground cover), which offers a variety of microhabitats for many species of plants and wildlife.

Coastal freshwater marsh wetlands are inundated for varying periods of time during winter and spring seasons. This community is dominated by perennial, non-woody plant species that are adapted to growing in wet conditions. Common plant species found in freshwater marshes include California bulrush (*Scirpus californicus*), common rush (*Juncus effusus*), Barbara sedge (*Carex barbarae*), rabbitsfoot grass (*Polypogon monspeliensis*), nutgrass (*Cyperus* spp.), brown-head rush (*Juncus phaeocephalus),* California blackberry (*Rubus ursinus*), and cattail (*Typha* spp.). These wetlands also provide nesting and foraging habitat for a variety of wildlife species, including waterfowl (ducks, geese, and swans), grebes, coots, cormorants, rails, shorebirds, and raptors.

Riparian habitats such as willow scrub, central coast arroyo-willow-riparian forest (designated as special-status habitat by CDFG), and coast live oak riparian woodland are of high value for wildlife species. They occur primarily adjacent to the pipeline corridors and in scattered patches throughout the study area. The willow scrub community is characterized by a dense thicket of trees, primarily arroyo willow (*Salix lsiolepus*). Other typical plant species include red alder (*Alnus rubra*), California box elder (*Acer negundo* ssp. *californica*), black cottonwood (*Populus balsamifera* spp. *trichocarpa*), big-leaf maple (*Acer macrophyllum*), and coast live oak (*Quercus agrifolia*). Common understory species associated with riparian habitats include California blackberry (*Rubus ursinus*), thimbleberry (*Rubus parviflorus*), stinging nettle (*Urtica doioca*), and creek dogwood (*Cornus glabrata*).

Riparian habitats are often linear in form and are therefore important to many wildlife species as movement corridors. The connectivity of riparian corridors to multiple habitats within a large area allows wildlife to migrate between areas during different life stages (reproduction, foraging, nesting, hibernating, etc.). Riparian communities also provide important nesting habitats for many species of birds, including three special-status species: San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), tricolored blackbird (*Agelaius tricolor*), and yellow warbler (*Dendroica petechia*).

Common wildlife species that are expected to occur in riparian habitats include Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), California slender salamander (*Batrachoseps attenuatus*), western aquatic garter snake (*Thamnophis couchi*), Wilson's warbler (*Wilsonia pusilla*), Bewick's wren (*Thryomanes bewickii*), green heron (*Butorides striatus*), numerous swallow species, raccoon (*Procyon lotor*), and western gray squirrel (*Sciuris gresius*). The increased structural complexity of riparian vegetation provides an abundance of perch sites for raptor species such as Cooper's hawk (*Accipiter cooperi*), red-shouldered hawk (*Buteo* lineatus), and, depending on adjacent vegetation, possibly merlin (*Falco columbarius*) and peregrine falcon (*Falco peregrinus*). Riparian streams also provide high-quality habitat for fish, including steelhead trout (*Oncorhynchus mykiss*), a Federal Threatened species, which is known to occur in Branciforte Creek, Arana Creek, Soquel Creek, and the San Lorenzo River, and which is expected in other streams and tributaries within the Santa Cruz watershed.

Special-Status Species

Many species of wildlife, including sensitive species, are expected to occur within the study area (Table 5.4-1). Riparian habitats, wetlands, and grasslands provide valuable resources for a diversity of wildlife, including reptiles, amphibians, birds, and mammals. Predators such as hawks, owls, foxes, and coyotes hide in riparian corridors and forage in wetlands and grasslands. Special-status species that could potentially occur in the study area include California red-legged frog (*Rana aurora draytonii*), southwestern pond turtle (*Clemmys marmorata pallida*), Ohlone tiger beetle (*Cicindela ohlone*), monarch butterfly (*Danaus plexippus*), and raptors. The potential for sensitive species occurrences at specific project locations is discussed below.

Special-status raptors known or expected to occur in the area include bald eagle (*Haliaeetus leucocephalus*), white-tailed kite (*Elanus leucurus),* American peregrine falcon (*Falco peregrinus*), Cooper's hawk (*Accipiter cooperi*), sharp-shinned hawk (*Accipiter striatus*), northern harrier (*Circus cyanus*), burrowing owl (*Athene canicularia*), Osprey (*Pandion haliaetus*), and merlin (*Falco columbarius*). White-tailed kite and burrowing owl are federal species of concern (FSC). Peregrine

Table 5.4-1
Special-Status Species Potentially Occurring within the Study Area

SPECIES		STATUS[1]			HABITAT
COMMON NAME	SCIENTIFIC NAME	USFWS	CDFG	CNPS	
PLANTS					
Blasdale's bent grass	*Agrostis blasdalei*	--	CSC	1B	Coastal dunes, coastal bluff scrub, coastal prairie
Slender silver-moss	*Anomobryum filiforme*	--	--	2	Broadleaved upland forest, North Coast coniferous forest, lower montane coniferous forest
Marsh sandwort	*Arenaria paludicola*	E	E	1B	Marsh and swamp, freshwater marsh, wetland
Swamp harebell	*Campanula californica*	--	CSC	1B	Meadow and seep, coastal prairie, North Coast coniferous forest, bog and fen, closed-cone coniferous forest, marsh and swamp, wetland
Bristly sedge	*Carex comosa*	--	--	2	Freshwater marsh, marsh and swamp, wetland
Deceiving sedge	*Carex saliniformis*	--	CSC	1B	Coastal prairie, coastal scrub, meadow and seep, marsh and swamp, wetland
Scott's Valley spineflower	*Chorizanthe robusta* var. *hartwegii*	--	E	1B	Meadow and seep, valley and foothill grassland
Robust spineflower	*Chorizanthe robusta* var. *robusta*	--	E	1B	Coastal bluff scrub, coastal dunes, cismontane woodland
Santa Cruz tarplant	*Holocarpha macradenia*	E	T	1B	Valley and foothill grassland, coastal prairie
Loma Prieta huita	*Huita srobilina*	FSC		1B	Chaparral, cismontane and riparian woodland areas
Elongate copper-moss	*Mielichhoferia elongata*	--	--	2	Cismontane woodland
Dudley's lousewort	*Pedicularis dudleyi*	Rare	CSC	1B	North Coast coniferous forest, redwood, valley and foothill grassland, chaparral
Gairdner's yampah	*Perideridia gairdneri* spp. *gairdneri*	FSC	--	4	Chaparral, coastal prairie, valley, foothill grassland, vernal pools
San Francisco popcorn-flower	*Plagiobothrys diffusus*	E	CSC	1B	Coastal prairie, valley and foothill grassland

Table 5.4-1 (Continued)
Special-Status Species Potentially Occurring within the Study Area

SPECIES		STATUS[1]			HABITAT
COMMON NAME	SCIENTIFIC NAME	USFWS	CDFG	CNPS	
Maple-leaved checkerbloom	*Sidalcea malachroides*	--	CSC	1B	Coastal scrub, broadleaved upland forest, coastal prairie, North Coast coniferous forest
San Francisco campion	*Silene verecunda* ssp. *verecunda*	--	CSC	1B	Coastal scrub, coastal bluff scrub, chaparral, coastal prairie, ultramafic, valley and foothill grassland
Santa Cruz clover	*Trifolium buckwestiorum*	--	CSC	1B	Coastal prairie, broadleaved upland forest, cismontane woodland
INVERTEBRATES					
Ohlone tiger beetle	*Cicindela ohlone*	E	--	--	Valley and foothill grassland
Globose dune beetle	*Coelus globosus*	FSC	--	--	Coastal dunes
Monarch butterfly	*Danaus plexippus*	--	CSC	--	Closed-cone coniferous forest, wind-protected tree groves (eucalyptus, Monterey pine, cypress)
Smith's blue butterfly	*Euphilotes enoptes smithi*	E	--	--	Coastal dunes, coastal scrub
Zayante band-winged grasshopper	*Trimerotropis infantilis*	E	--	--	Zayante Sand Hill System
FISH					
Tidewater goby	*Eucyclogobius newberryi*	E	CSC	--	Klamath/ North Coast flowing waters, Sacramento/San Joaquin flowing waters, aquatic, south coastal flowing waters
Steelhead-central California coast ESU	*Oncorhynchus mykiss irideus*	T	--	--	Aquatic, Sacramento/San Joaquin flowing waters, coastal flowing waters

Table 5.4-1 (Continued)
Special-Status Species Potentially Occurring within the Study Area

SPECIES		STATUS[1]			HABITAT
COMMON NAME	SCIENTIFIC NAME	USFWS	CDFG	CNPS	
REPTILES					
Southwestern pond turtle	*Clemmys marmorata pallida*	FSC	CSC	--	Aquatic, artificial flowing waters, Sacramento/San Joaquin standing waters, marsh and swamp, Sacramento/San Joaquin flowing waters, wetland
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	E	E, FP	--	Artificial standing waters, marsh and swamp, Sacramento/San Joaquin standing waters, wetland
AMPHIBIANS					
California red-legged frog	*Rana aurora draytonii*	T	CSC	--	Lowlands and foothills with permanent sources of deep water with dense riparian vegetation
Foothill yellow-legged frog	*Rana boylii*	FSC	CSC	--	Variety of habitats with shallow, flowing water, small to moderate-sized streams with some cobble-sized substrate
BIRDS					
Cooper's hawk	*Accipiter cooperi*	--	CSC	--	Riparian and live oak habitats usually, but variety of habitats near water
Sharp-shinned hawk	*Accipiter striatus*	--	CSC	--	Nesting - riparian, deciduous, mixed conifer; prefers riparian habitats
Tricolored blackbird	*Ageliaus tricolor*	FSC	CSC	--	Nesting colony - Central Valley and vicinity; requires open water, protected nesting substrate (e.g., emergent vegetation) and foraging area
Golden eagle	*Aquila chrysaetos*	--	CSC, FP	--	(Nesting and wintering) rolling foothills, mountain areas, sage-juniper flats, desert.

Table 5.4-1 (Continued)
Special-Status Species Potentially Occurring within the Study Area

SPECIES		STATUS[1]			HABITAT
COMMON NAME	SCIENTIFIC NAME	USFWS	CDFG	CNPS	
Burrowing owl	*Athene cunicularia*	FSC	CSC	--	Burrow sites in open, dry annual or perrenial grasslands, deserts, and scrublands with low-growing vegetation
Western snowy plover	*Charadrius alexandrinus nivosus*	T	CSC	--	Great Basin standing waters, wetland, sand shore
Northern harrier	*Circus cyanus*	--	CSC	--	Foothill and valley grasslands, meadows, emergent wetlands, rarely found in heavily wooded areas
Black swift	*Cypseloides niger*	FSC	CSC	--	Rocky cliffs for nesting
Yellow warbler	*Dendroica petechia brewsteri*	--	CSC	--	Riparian woodlands
White-tailed kite	*Elanus leucurus*	FSC	FP	--	Open grassland, meadows, oak and deciduous woodland
Merlin	*Falco columbarius*	--	CSC	--	Ranges from annual grasslands to ponderosa pine and montane hardwood-conifer habitat (including open grasslands and woodlands)
American peregrine falcon	*Falco peregrinus*	D, FSC	E, FP	--	Near wetlands, lakes, rivers, or other water (nesting): on cliffs, dunes, mounds, and human-made structures
Salt-marsh common yellowthroat	*Geothlypid trichas sinuosa*	FSC	CSC	--	San Francisco bay region, salt and freshwater marshes
Bald eagle	*Haliaeetus leucocephalus*	T, FPD	E, FP	--	(Nesting and wintering) ocean shore, lake margins &and rivers, old-growth, or dominant live tree with oOpen branches
Loggerhead shrike	*Lanius ludovicianus*	FSC	CSC	--	Variety of open habitats, including valley foothill woodland and riparian
California black rail	*Laterallus jamaicensis coturniculus*	FSC	T	--	Salt marshes

Table 5.4-1 (Continued)
Special-Status Species Potentially Occurring within the Study Area

SPECIES		STATUS[1]			HABITAT
COMMON NAME	SCIENTIFIC NAME	USFWS	CDFG	CNPS	
Osprey	*Pandion haliaeetus*	--	CSC	--	(Nesting) ocean shore, bays, freshwater lakes, and larger streams
MAMMALS					
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*	FSC	CSC	--	Humid coastal regions of Northern and Central California; roosts in caves, lava tubes, mines, etc.
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*	FSC	CSC	--	Riparian, chaparral, and redwood and mixed evergreen forests
COMMUNITIES					
Central dune scrub		--	--	--	Coastal dunes
Central coast arroyo willow riparian forest					Riparian
Coastal and valley freshwater marsh		--	--	--	Wetland, marsh, and swamp
Coastal brackish marsh		--	--	--	Wetland, marsh, and swamp
Monterey pine forest		--	--	--	Closed-cone coniferous forest

Source: EDAW 2003
-- = Not applicable
[1] Legal Status Definitions

U.S. Fish and Wildlife Service Federal Listing Categories

- *E Endangered (legally protected)*
- *T Threatened (legally protected)*
- *D Delisted*
- *FP Fully Protected (legally protected, no take allowed)*
- *PT Proposed for Threatened Status (legally protected as a threatened species by federal agencies)*
- *FC Candidate for listing as threatened or endangered (no formal protection)*
- *FSC Federal Species of Concern (no formal protection)*
- *FPD Federally Proposed for Delisting*

CDFG = California Department of Fish and Game
CNPS = California Native Plant Society

California Department of Fish and Game State Listing Categories

- *E Endangered (legally protected)*
- *T Threatened (legally protected)*
- *R Rare (legally protected)*
- *FP Fully Protected (legally protected, no take allowed)*
- *CSC California Species of Special Concern (no formal protection)*

California Native Plant Society Categories

- *1B Plant species considered rare or endangered in California and elsewhere (but not legally protected under the federal or state endangered species acts)*
- *2 Plant species considered rare or endangered in California but more common elsewhere (but not legally protected under the federal or state endangered species acts)*
- *4 Limited distribution*

falcon is also a FSC and State Endangered species. The other species are listed as California species of special concern (CSC). With the exception of merlin and osprey, which are expected to occur in the study area only during winter, all of these raptors could potentially be found nesting and foraging within the study area in grassland (or other open country), riparian, open water, and/or wetland habitats. Suitable foraging habitat is found throughout the Industrial Park, Terrace Point, and Shaffer Road/Antonelli's Pond Areas.

Bald Eagle

Bald eagle is a Federal Threatened and State Endangered species and is fully protected under the Bald Eagle Protection Act. Bald eagles occur throughout North America and are typically found near wetlands, lakes, and streams and along coastal rivers and cliffs (Detrich 1985). Bald eagles typically winter along rivers, reservoirs, lakes, and wetlands that provide large trees for perching and an abundance of fish or waterbirds for prey items. There are no reported observations of this species nesting in the study area; however, this species is expected to be a winter visitor to the study area.

White-tailed Kite

White-tailed kite is a CSC and fully protected species; it forages primarily in and around grasslands, wetlands, and marshes close to isolated trees that are used for nesting and perching. The highest potential for occurrence of this species is in areas near open grassland and isolated trees, such as those found in the Terrace Point and Antonelli's Pond Areas. This species has been observed foraging in the Antonelli's Pond Area.

Peregrine Falcon

Peregrine falcon was delisted as a Federal Endangered species in 1999 and is currently an FSC. It is still listed by the State of California as endangered. Along the coast, this species typically forages along shorelines and coastal wetland and grassland habitats. Therefore, the study areas near these habitats have the highest potential for species occurrence. This species typically nests along cliffs and man-made structures. Suitable nesting habitat potentially occurs along the pipeline corridors where cliffs, banks, or man-made structures could be utilized as nest sites.

Cooper's Hawk

Cooper's hawk (listed as a CSC) nests primarily in deciduous trees, including those found in riparian areas. The primary food item is small birds, but can also include small mammals, amphibians, and reptiles. This species has the greatest potential to occur in riparian habitats, such as those associated with Antonelli's Pond and Rodeo Gulch.

Northern Harrier

Northern harrier is a CSC. Harriers are present within the study area throughout the year, but are most common in the fall and winter, foraging over open grassland. Their primary habitats include emergent wetlands and meadows. Therefore, they have the greatest potential to occur in open areas near these habitats. Nesting was observed at the Terrace Point Area in 1992 and in adjacent areas such as Younger Lagoon in 1993 (Biotic Resources 2002).

Burrowing Owl

Western burrowing owl (FSC and CSC) is a grassland species found in a variety of open habitats with low-growing vegetation and bare ground, including non-native grassland. Burrowing owls are dependent on small mammal burrows (primarily those of ground squirrels), which they use for nesting and roosting. The potential for burrowing owl occurrence is highest where low-growing vegetation is present, such as the proposed desalination areas, but could also occur along any levees or fields in and adjacent to the pipeline corridors.

Loggerhead Shrike, Tricolored Blackbird

Two other special-status bird species that could potentially occur in the study area vicinity are the loggerhead shrike (CSC) and tricolored blackbird (FSC with respect to nesting habitat). Loggerhead shrike is an uncommon winter visitor and is not expected to nest in the area. Tricolored blackbirds can be found nesting in open-water habitats with emergent vegetation (such as freshwater marshes), but may also use vegetation such as blackberry and riparian scrub. Multiple observations of this species have been reported in the CNDDB for Santa Cruz County. The areas with the highest potential for occurrence are the Antonelli's Pond and Terrace Point Areas due to their proximity to water and emergent vegetation in Antonelli's Pond and Younger Lagoon. However, no suitable nesting habitat occurs in the proposed Program area. Therefore, blackbirds are expected to utilize the study area for foraging only.

California Red-Legged Frog

Multiple sightings have been reported in the study area vicinity for California red-legged frog (Federal Threatened and CSC). This subspecies of red-legged frog occurs from sea level to elevations near 5,000 feet. It has been extirpated from 70 percent of its former range and is now found primarily in coastal drainages of central California, from Marin County south to northern Baja California. The USFWS designated critical habitat in March 2003 (66 CFR 14625), including drainages within Santa Cruz County. However, no designated critical habitat for the California red-legged frog occurs within the study area. Potential threats to the species include elimination or degradation of habitat from land development and land use activities as well as habitat invasion by non-native aquatic species (USFWS 2002). The California red-legged frog requires a variety of habitat elements, with aquatic breeding areas typically located within a matrix of riparian and upland dispersal habitats. Breeding sites of the California red-legged frog include freshwater habitats, such as pools and backwaters within streams, creeks, ponds, marshes, springs, and lagoons. This species has been observed at Antonelli's Pond, Moore Creek Wetland, and Natural Bridges State Park and has a high potential to occur in scattered aquatic locations throughout the study area.

Southwestern Pond Turtle

The southwestern pond turtle is an FSC and is found in a variety of habitats, including lakes, rivers, streams, and stock ponds. The turtle usually leaves aquatic sites to reproduce and over-winter. Pond turtles may nest in upland habitat, sometimes 400 meters or more from aquatic sites, or in sandy banks along rivers and streams. Pond turtles hibernate in burrows constructed in upland vegetation. Areas with the highest potential for occurrence are those adjacent to permanent and semipermanent water sources. However, pond turtles can also migrate across large open areas in order to reach suitable nesting and burrow sites and could therefore occur, depending on the time of year, throughout the proposed Program study area.

Central California Coast Steelhead

The Central California Coast Evolutionary Significant Unit (ESU) of steelhead (*O. m. irideus*) is listed as Federal Threatened within the study area. The ESU includes all naturally spawned populations of steelhead (and their progeny) in California streams, from the Russian River to Aptos Creek, and from the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), excluding the Sacramento–San Joaquin River Basin (62 CFR 43937). Steelhead have been reported in Arana Gulch, Soquel Creek, Majors Creek, and the San Lorenzo River (CNDDB).

San Francisco Dusky-footed Woodrat

The San Francisco dusky-footed woodrat is an FSC and a CSC. This species is found in a variety of habitats, including riparian, chaparral, and redwood and mixed evergreen forests. This species has the potential to occur within the study area wherever suitable habitat is present. The highest potential for occurrence is in areas with riparian or chaparral vegetation (e.g., Antonelli’s Pond and Industrial Park Areas, and along Moore Creek).

Ohlone Tiger Beetle

Ohlone tiger beetle (*Cicindela ohlone*) is a Federal Endangered species and is found in Santa Cruz County in remnant native grasslands with California oat grass (*Danthonia californica*) and purple needlegrass (*Nasella pulchra*). This species has been documented in the Moore Creek drainage (CNDDB 2003) and therefore has a potential to occur in the study area. However, occurrence is unlikely due to the absence of remnant native grassland within the proposed Program study area.

Monarch Butterfly

The monarch butterfly is designated as a “special animal” by CDFG. “Special animal” is a general term for animals that are listed in the CNDDB, regardless of their legal or protection status. Although this species is not listed by the USFWS or CDFG, California law (Assembly Bill No. 167, September 1987) recognizes monarch butterfly over-wintering colonies as “special resources” in California, and thus the species is protected. CDFG lists monarch butterfly winter roost sites as sensitive habitats. This species has been observed in Natural Bridges State Park, which includes the Monarch Grove (a designated Monarch Butterfly Natural Preserve), and along Moore Creek (CNDDB 2003).

Over-wintering habitat for monarch butterflies is generally composed of large stands of trees, including eucalyptus (*Eucalyptus* spp.), Monterey pine (*Pinus radiate*), and Monterey cypress (*Cupressus macrocarpa*) that exhibit specific habitat characteristics (e.g., canopy density, protection from prevailing wind, special arrangement of roost trees, low-temperature variation, and specific types of edge vegetation). This species has the potential to occur within the study area wherever large stands of their preferred trees are present.

Smith's Blue Butterfly

Smith's blue butterfly (*Euphilotes enoptes smithi*) is Federal Endangered and occurs in coastal dune, grassland, coastal sage scrub, and chaparral. This species is closely tied to its host plants—coast buckwheat (*Eriogonum latifolium*) and cliff buckwheat (*Eriogonum parvifolium*)—and this species' survival is therefore dependent upon the number of host plants within these habitats. This species has not been observed within the study area, but could occur wherever the host plants are present.

Invertebrate Species Eliminated from Consideration

Due to the absence of requisite habitats, many invertebrate species would not be expected to occur within the study area. California linderiellia (*Linderiellia occidentalis*) is found only in vernal or seasonal ponds, which do not occur within the study area, and it has therefore been eliminated from consideration. The globose dune beetle (*Coelus globosus*) is found in coastal sand dune habitat and often burrows beneath the sand under dune vegetation. Since coastal sand dune habitat does not occur within the study area, the globose dune beetle was not considered for potential occurrence. The Zayante band-winged grasshopper (*Trimerotropis infantilis*: Federal Endangered) is restricted to sand parkland habitat within the Zayante Sand Hills System and does not occur within the study area. Therefore, this species was not considered for potential occurrence. Additionally, cave-dwelling species such as Empire Cave pseudoscorpion (*Fissilicreagris imperialis*), Dolloff Cave spider (*Meta dolloff*), and Mackenzie's Cave amphipod (*Stygobromus mackenziei*) were eliminated from consideration due to the absence of caves within the study area.

Sensitive Plant Species

Three sensitive plant species listed in the CNDDB have been identified in the Santa Cruz quadrangle and could potentially occur within the proposed Program area: San Francisco popcorn flower (*Plagiobothrys diffusus*), Santa Cruz tarplant (*Holocarpha macradenia*), and robust spine-flower (*Chorizanthe robusta* var. *robusta*). San Francisco popcorn flower and Santa Cruz tarplant occur in coastal prairie and non-native grassland. These species could potentially occur in the desalination areas (Terrace Point, Shaffer Road/Antonelli's Pond, and Industrial Park). San Francisco popcorn flower has been reported to occur in the Moore Creek corridor. The Santa Cruz tarplant and Santa Cruz clover have been reported primarily in the Soquel area, and the robust spine-flower has been reported near Rodeo Gulch and in the San Lorenzo River area. Therefore, these species have the potential to occur within the study area (primarily in the D-2 distribution pipelines area and adjacent habitat). In addition, Gairdner's yampah (*Perideridia gairdneri* spp. *gairdneri*) typically occurs in chaparral, coastal prairie, valley, foothill grassland, and vernal pools and has the potential to occur at the Industrial Park Area, the Shaffer Road/Antonelli's Pond Area, and along pipeline alignments. The Loma Prieta huita (*Huita srobilina*), typically found in chaparral and cismontane and riparian woodland areas, has the potential to occur along pipeline alignments, primarily at creek crossings.

<u>Alternatives D-1 and D-2 (Applicable to both Alternatives)</u>

Desalination Plant Location

The potential locations of proposed Program components are shown on Figures 4-1 and 4-2 of Chapter 4, Program Description.

Industrial Park Area. The Industrial Park Area is bounded by Delaware Avenue to the south and Mission Street to the north. Lower Arroyo Seco Canyon Creek (also known as Meder Creek) runs through this area, but has been realigned and restored from its original course into an artificial channel. The restoration area includes a 140-foot corridor, which has been planted with native wetland and riparian plants including willows (*Salix* spp.) and oaks (*Quercus* spp.). Two large buildings (Lipton plant and Wrigley plant) are present in the western portion of the study area, which is surrounded by ornamental trees, a large manicured grass area, and a paved parking lot. The unoccupied eastern parcel is sparsely vegetated and dominated by non-native grassland.

The Industrial Park Area is primarily surrounded by industrial uses and is adjacent to Natural Bridges State Park to the southeast.

Sensitive species expected to occur in this area include foraging raptors such as northern harrier, white-tailed kite, Cooper's hawk, sharp-shinned hawk, merlin, and peregrine falcon, as well as riparian nesting neotropical migrants such as yellow warbler. There is also a potential for occurrence of California red-legged frog in lower Arroyo Seco Canyon Creek and adjacent uplands.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is west of and adjacent to Antonelli's Pond and the Moore Creek drainage area. Antonelli's Pond is an artificial impoundment along lower Moore Creek, just upstream from the crossing of Delaware Avenue. The pond was created in the early 1900s and is owned by the Santa Cruz County Land Trust. Although the pond is artificial, it provides freshwater marsh vegetation, a community that has declined throughout the region. The pond also provides habitat for many freshwater-dependent wildlife, including the tricolored blackbird, western pond turtle, and California red-legged frog (CNDDB 2003). Although breeding populations have been historically documented in Antonelli's Pond (Bulger 1999), the pond is currently reported as supporting large populations of bullfrogs, and is therefore now considered a sink for California red-legged frogs (Lenington 2003). Potential sensitive species expected to occur in this area include foraging raptors (as discussed for the Industrial Park Area, above) California red-legged frog, and San Francisco dusky-footed woodrat.

Terrace Point Area. The Terrace Point Area is bordered on the east by Shaffer Road and on the west by Younger Lagoon; it extends from the beach north to McPherson Street. The Seymour Marine Discovery Building and a NOAA Fisheries building are located in the Terrace Point Area. The majority of the area is undeveloped. The dominant vegetation consists primarily of non-native grassland and coyote brush scrub grassland (Strelow 1997; UCSC 2004). Other vegetation communities include freshwater marsh, coastal terrace, and central coast arroyo-willow-riparian forest. Many wildlife species are either known to occur in the area or have a high potential to occur in the area. These species include, but are not limited to, California red-legged frog, white-tailed kite, northern harrier, and burrowing owl. Younger Lagoon is adjacent to this area and is part of the University of California Natural Reserve System. Younger Lagoon provides habitat for numerous migratory bird species, including known populations of salt-marsh common yellowthroat and San Francisco dusky-footed woodrat (Huffman-Broadway Group, Inc. 2002).

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1). The proposed pipeline corridor traverses existing road right-of-ways within the city. These roadways are located along industrial and residential areas (adjacent to warehouses, offices, and houses). In general, within the western portion of the proposed Program study area, the proposed pipeline corridor is adjacent to the desalination areas, but also crosses and/or runs parallel with Natural Bridges State Park, Moore Creek, and Antonelli's Pond. The habitats and species potentially occurring at these areas are described above.

Junction Structure. The City's abandoned wastewater outfall would be converted for use as raw water intake. The existing junction structure is located at the beach near the intersection of West Cliff Drive and Sunset Avenue and would accommodate a new pumping station. A large Monterey cypress tree (*Cupressus macrocarpa*) north of the junction structure is of local interest, as it is the only large tree along this stretch of the coast line and meets the criteria of the Tree Heritage Ordinance. The dominant vegetation in this area is non-native grasses and ice plant (*Carpobrotus edulis*). The beach area does not contain any tidepool habitat and is primarily covered by sand and rocks.

Treated Water Distribution Pipeline (Corridor 2 and 3). The treated water distribution pipeline corridors (Corridors 2 and 3) would follow existing public road right-of-ways. Corridor 2 would be located east of the Moore Creek Preserve, along the riparian corridor. The preserve contains the most contiguous section of oak riparian habitat in the city (Biotic Resources 2002) and is also a known location of the Federal Threatened California red-legged frog. The corridor would cross Arroyo Seco Canyon Creek. The main stem of Arroyo Seco Canyon Creek supports mixed riparian woodland, dominated by willows and coast live oak.

Corridor 3 is located on public road right-of-ways, primarily along Bay Street and Escolana Drive. Several sensitive species could potentially occur along this segment due to its close proximity to Arroyo Seco Canyon Creek and the riparian vegetation along the road right-of-ways.

Several sensitive species could potentially occur along this section of the study area due to the close proximity of the Moore Creek riparian corridor and Arroyo Seco Canyon Creek. Adjacent riparian habitats could provide nesting and perching habitat for many avian species, including yellow warbler, and special-status raptors.

Concentrate Discharge Pipeline (Corridors 1 and 4). Corridor 4 is located along existing public road right-of-ways and is not expected to be near any creeks or other sensitive habitat. Species potentially occurring in this area primarily include raptors in trees along the right-of-way and near construction activities.

Alternative D-2 (Applicable to this Alternative Only)

D-2 Distribution Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. The D-2 distribution pipelines would be constructed within existing public road right-of-ways, but would have to cross or run parallel to multiple creeks and riparian corridors such as Arana Gulch, Rodeo Gulch, Branciforte Creek, Soquel Creek, and Twin Lakes. The CNDDB reports several sightings of central California coast steelhead in both Arana Gulch and Soquel Creek. Species that could potentially occur in the proposed Program area include those associated with riparian corridors and vegetation, as discussed above.

5.4.3 Regulatory Framework

Regulations applicable to the proposed Program are discussed above. These are intended to protect sensitive biological resources, including habitat and wildlife and plant species.

Federal Endangered Species Act

Please refer to Section 5.2, Marine Resources, for a discussion of this act.

Migratory Bird Treaty Act

Please refer to Section 5.2, Marine Resources, for a discussion of this act.

Bald Eagle Protection Act

The federal Bald Eagle Protection Act prohibits persons within the United States (or other places subject to U.S. jurisdiction) from “possessing, selling, purchasing, offering to sell, transporting, exporting or importing any bald eagle or any golden eagle, alive or dead, or any part, nest or egg thereof.”

Clean Water Act

The U.S. Army Corps of Engineers (the Corps) regulates discharges of fill or dredged materials into waters of the United States under Section 404 of the Clean Water Act. Waters of the United States include lakes; rivers, streams, and their tributaries; and adjacent or hydrologically connected wetlands. Wetlands are defined under Section 404 as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that do support under normal circumstances, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328; 40 CFR 230). Activities that require a permit under Section 404 include placing fill or riprap, grading, mechanized land clearing, and dredging. Activities that result in the deposit of dredged or fill material below the ordinary high-water mark of waters of the United States or within a jurisdictional wetland typically require a Section 404 permit, even if the area is dry at the time the activity takes place.

The Clean Water Act and the associated guidelines outlined in a memorandum of agreement (MOA) between USEPA and the Corps, dated November 15, 1989, set forth a goal of restoring and maintaining existing aquatic resources. This MOA directed the Corps to strive to avoid adverse impacts and to offset unavoidable adverse impacts to existing aquatic resources, and, for wetlands, to strive to achieve a goal of an overall net loss of values and functions. While focusing the no-net-loss policy on wetlands, the MOA also noted the value of other waters of the United States, such as streams, rivers, and lakes. Under the guidelines, all waters of the United States are afforded protection, including requirements for appropriate and practicable mitigation based on values and functions of the aquatic resource that will be affected.

In 2001, the U.S. Supreme Court ruled in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* that the Corps has jurisdiction only over wetlands that are adjacent to navigable waters of the United States, interstate waters, and all other waters where use, degradation, or destruction could affect interstate or foreign commerce, or tributaries to any of these waters. This ruling reversed roughly two decades of the Corps' claims of jurisdiction over "isolated" waters under the interstate commerce clause of the U.S. Constitution based on use by migratory waterfowl. The Corps is currently evaluating its jurisdiction over isolated wetlands on a case-by-case basis.

State Regulations

California Endangered Species Act

Please refer to Section 5.2, Marine Resources, for a discussion of this act.

California Coastal Act

Section 30240 of the California Coastal Act states that "environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas…Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas." The Coastal Act defines environmentally sensitive areas as "any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments."

CEQA Guidelines Section 15380

Although threatened and endangered species are protected by specific federal and state statutes, *CEQA Guidelines* Section 15380(b) provides that a species not included on the federal or state lists of protected species may be considered rare or endangered if the species can be shown to meet certain criteria. These criteria have been modeled after the definition in the FESA and the section of the California Fish and Game Code dealing with rare or endangered plants or animals. This section was included in the *CEQA Guidelines* primarily to deal with situations in which a public agency is reviewing a project that may have a significant effect on, for example, a “candidate species” that has not yet been listed by either the USFWS or CDFG. Thus, CEQA provides an agency with the ability to protect a species from a project’s potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

Vascular plants listed as rare or endangered by the CNPS (Skinner and Pavlik 1994), but which have neither designated status nor protection under federal or state endangered species legislation, are defined as follows:

- **List 1A:** Plants believed extinct
- **List 1B:** Plants rare, threatened, or endangered in California and elsewhere
- **List 2:** Plants rare, threatened, or endangered in California, but more numerous elsewhere
- **List 3:** Plants about which we need more information – a review list
- **List 4:** Plants of limited distribution **–** a watch list

In general, plants appearing on CNPS List 1 or 2 are considered to meet CEQA’s Section 15380 criteria for rarity, and substantial adverse effects to these species are therefore often considered significant impacts under CEQA.

Section 1600 of the California Fish and Game Code

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by CDFG, pursuant to Sections 1600 through 1603 of the California Fish and Game Code. Section 1602 states that it is unlawful for any person to substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated by CDFG; or to use any material from the streambeds, without first notifying CDFG of such activity. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and that supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. CDFG’s jurisdiction within altered or artificial waterways is based upon the value of those waterways to fish and wildlife. A CDFG streambed alteration agreement must be obtained for any proposed project that would result in an impact to a river, stream, or lake.

California Fish and Game Code Section 3503

All active bird nests (except for those of English sparrows and starlings) are protected in California under the Fish and Game Code, Section 3503. Birds of prey are protected in California under Fish and Game Code Section 3503.5 (1992). Section 3503.5 states that it is “unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered a "taking" by CDFG. This statute does not provide for the issuance of any type of incidental take permit.

Local

City of Santa Cruz

Numerous local plans, policies, and regulations pertain to waterways and wetlands and the biological resources they support. The most relevant policy is the Environmental Quality Element of the *City's General Plan and Local Coastal Program* (City of Santa Cruz) (see Appendix B for a list of relevant goals and policies). In general, the Environmental Quality Element requires a 100-foot setback from all wetlands and from the center of the watercourse for all riparian areas; where riparian vegetation extends beyond 100 feet from the center watercourse, or where no watercourse is present, all of the riparian vegetation is to be included in the setback. Subsections of this policy prohibit construction activities, grading, or removal of vegetation within riparian and wetland resources, including the buffer (i.e., 100-foot setback) unless such activities are consistent with an adopted management plan (i.e., *City-wide Creek Study and Management Plan*). Section 24.14.080 of the City's zoning ordinance also prohibits construction of main or accessory structures, grading, and removal of vegetation within 100 feet from the center watercourse of riparian areas, or within 100 feet of a wetland. Section 24.14.800 (4a-e) allows for limited uses, including maintenance and repair of existing public works facilities and projects, previous non-motor vehicle trails, and incidental public service projects.

Heritage trees are defined by the City of Santa Cruz Zoning Code as "any perennial plant or grove of perennial plants growing on public or private property, having a self-supporting woody main stem or trunk usually characterized by the ability to grow to considerable height and size and the development of woody branches at some distance above the ground, and meeting criteria set forth in Section 9.56.040.I." Heritage trees are present near the junction structure and are likely to be present elsewhere in the study area. These trees are protected by guidelines set forth in the General Plan.

Santa Cruz County

The *Santa Cruz County General Plan and Local Coastal Program* chapter on conservation and open space contains many policies that pertain to sensitive biological resources. Relevant policies include the protection of sensitive habitats, such as riparian corridors, wildlife corridors, habitat of special-status species, and habitat adjacent to special-status species locations, as well as provision of a setback of 100 feet from wetlands. Appendix B identifies General Plan policies relevant to the proposed Program.

City of Capitola

There are several significant policies relating to sensitive biological resources in the *City of Capitola General Plan*. Appendix B identifies General Plan policies relevant to the proposed Program, such as the Conservation Element goal of protecting and preserving the natural resources within the Capitola area, including riparian corridors (Policy 10, 11, and 16) and monarch butterfly habitats (Policy 18). The Soquel Creek drainage is mentioned in numerous policies. The Conservation Element policies include preserving natural vegetation, maintaining adequate flows for fish, and protecting water quality in creeks and wetlands from sedimentation, biochemical degradation, and thermal pollution.

5.4.4 Impacts and Mitigation Measures

Significance Criteria

In accordance with Appendix G of the *CEQA Guidelines*, the proposed Program would have a significant impact to biological resources if it would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG or USFWS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by CDFG or USFWS;
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrologic interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources such as a tree preservation policy or ordinance;
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the proposed Program (including, but not limited to the General Plan, Specific Plan, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect; or
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

In addition, impacts were considered significant if they would:

- Substantially reduce the habitat of a fish or wildlife species;
- Cause a fish or wildlife population to drop below self-sustaining levels;
- Threaten to eliminate a plant or animal community; or

- Reduce the number or restrict the range of an endangered, rare, or threatened species.

Potential impacts can be classified as direct or indirect. Direct impacts include those that may result from an activity, such as increased human activity and noise, which would disturb or interfere with breeding or foraging. Indirect impacts are those impacts that are reasonably foreseeable effects caused by the action but that may occur later and not necessarily at the location of the direct effect (i.e., removal of vegetation in a waterway may increase the potential for sedimentation at that site or downstream later in the year). .

Impacts can be short term or long term. Short-term activities are those that are brief relative to the duration of a breeding season or other biological time context. The significance level of the impact depends on the duration of the temporal loss and the ability of the population to respond to changes.

The proposed Program would not substantially interfere with the movement of any native resident or migratory fish or wildlife species or affect any wildlife corridors or nursery sites. Relevant land use plans, policies, and regulations are provided under the Regulatory Framework portion of this section. The proposed Program would be consistent with the protective measures defined in these plans to protect biological resources. In addition, the proposed Program is not in an area covered by a habitat conservation plan or natural community conservation plan. Therefore, no further discussion of these is issues is required.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Subsequent expansion of the plant is not anticipated to require additional facilities outside of the 2.5-mgd plant footprint. Therefore, no additional evaluation of potential biological impacts is provided for plant expansion. If additional facilities are determined necessary at the time of expansion, they would be appropriately evaluated. Table 5.4-2 summarizes potentially significant impacts.

Table 5.4-2
Summary of Potential Impacts – Biological Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.4-1: Impacts to special-status plant species	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.4-2: Impacts to special-status birds, including raptors	◐	◐	--	--	--	◐	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.4-3: Impacts to special-status reptiles and/or amphibians	◐	◐	--	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.4-4: Impacts to special-status mammals	◐	◐	--	--	--	--	○	◐	◐	○	◐	○	○	○	○	○	○
Impact 5.4-5: Input of sediment and/or pollutants into steelhead habitat	◐	◐	--	--	--	--	○	○	○	○	○	○	○	◐	◐	◐	◐
Impact 5.4-6: Increased sedimentation, erosion, and/or pollution into wetland and/or waters of the U.S	◐	◐	--	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

(table continued on next page)

Table 5.4-2 (CONTINUED)
Summary of Potential Impacts – Biological Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.4-7: Construction activities have the potential to impact loggerhead shrike, Ohlone tiger beetle, monarch butterfly, and Smith's blue butterfly	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.4-8: Groundwater extraction from the Live Oak wells has the potential to impact biological resources through reduction of surface water flow in local creeks, rivers, coastal lagoons, and estuaries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less Than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

Impacts and Mitigation

☒ **Impact 5.4-1: Construction of the proposed Program could result in impacts to special-status plant species, elimination of a plant community, or effects to protected trees. Less than Significant after EIR-Identified Mitigation.**

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant, Conveyance and Pumping Facilities

No special-status plant species have been reported within the proposed Program area. However, the San Francisco popcorn flower is known to occur within the Moore Creek and Wilder Creek watersheds north of the proposed Program area. Therefore, grasslands in the desalination areas and D-1 pipeline corridor (Corridor 2 along Western Avenue) have the potential to support populations of the popcorn flower, which could be affected during construction. Floristic surveys during the proper flowering season have not been conducted in the study area. Such surveys would be required for the desalination areas as well as pipeline corridors where native vegetation and habitat could be affected.

Landscape and native trees are located along pipeline corridors within the study area. Construction activities have the potential to harm or kill these trees if conducted within the drip-line. If such trees are considered protected under an affected jurisdiction’s tree ordinance, impacts would be considered potentially significant. A Monterey cypress tree, protected under the City’s tree ordinance, is located near the existing junction structure. If construction activities for the intake pumping facility occurred within the drip-line of the tree, the tree could be adversely affected. Appropriate flagging and avoidance would be required for tree protection.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. No special-status plant species have been reported along the pipeline corridors. However, sections of the pipeline corridors are either near, run parallel to, or cross habitat that may support sensitive plant species.

<u>Mitigation Measures</u>

Mitigation Measure 5.4-1a: This mitigation measure applies to all proposed Program components. Due to the potential for sensitive plant species to occur within the proposed desalination areas, preconstruction surveys for sensitive plant species shall be conducted during the appropriate flowering season within these areas prior to construction activities. Additionally, preconstruction surveys for sensitive plants shall be conducted in areas along and/or crossing pipeline corridors and conveyance facilities where construction activities (trenching, boring, ripping, or ground disturbance) would occur within vegetated areas (i.e., not on paved or cemented areas).

If any special-status species are present within the study area, the City shall consult with the appropriate agency (CDFG and/or USFWS) for avoidance and/or mitigation measures. These may include but are not limited to:

- Limitations on construction timing to avoid flowering season
- Revegetation with native species
- Preservation and reuse of top 6 inches of soil as topsoil cover

Mitigation Measure 5.4-1b:. This mitigation measure applies to the pipeline and intake pumping facility component. The City shall hire a qualified biologist to conduct a survey along the pipeline alignment to identify trees that are protected under the affected jurisdictions' tree ordinances. If necessary, as in the case of the pumping facility, appropriate flagging or fencing would be installed around the drip-line of any tree identified for protection. Construction activities shall avoid the exclusionary zones.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.4-2: Construction of the proposed Program could result in impacts to special-status avian species, including raptors. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to both Alternatives)

Impacts would be confined to rare, special-status, or sensitive species because the proposed Program is not large enough to substantially reduce the habitat of a common wildlife species or to cause a common wildlife population to drop below self-sustaining levels.

Many species of wildlife utilize habitats within and adjacent to the study area for nesting, reproduction, and foraging. Proposed Program construction has the potential to significantly affect special-status raptors and other birds, including but not limited to osprey, white-tailed kite, northern harrier, Cooper's hawk, sharp-shinned hawk, and yellow warbler. The potential exists for both direct impacts (such as the removal of nest trees and foraging habitat) and indirect impacts (such as reduced nest success and/or abandonment due to increased noise and disturbance from adjacent construction activity).

The proposed desalination plant is the only component of the proposed Program with the potential to permanently remove habitat for wildlife species and therefore to have long-term or permanent impacts. Pipeline construction, consisting of trenching, backfilling, and revegetation activities, would result in temporary impacts to special status avian species.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant Location

Industrial Park Area. There are no recorded special-status species nesting in the Industrial Park Area; due to the lack of suitable nesting habitat, the potential for occurrence is considered low. Therefore, no significant impact to special-status birds in the Industrial Park Area are anticipated.

Shaffer Road/Antonelli's Pond Area. Tricolored blackbirds are known to occur in adjacent habitat surrounding the proposed Program area (i.e., Antonelli's Pond and surrounding vegetation). Additional special-status avian species that may be found in adjacent habitat include the white-tailed kite, northern harrier, sharp-shinned hawk, and yellow warbler. The proposed construction area would be located on previously disturbed areas and would not remove riparian or wetland vegetation. The potential exists, however, for indirect impacts on special-status species in adjacent habitats due to construction noise and activity.

Terrace Point Area. The Terrace Point Area is a known foraging and nesting location for northern harrier and white-tailed kite. Coastal scrub and seasonal wetland vegetation on site provide nesting and foraging habitat for both species. Additional raptors such as peregrine falcon, merlin, and burrowing owl have been observed foraging on this site. Tricolored blackbirds have been observed in adjacent habitat (Antonelli's Pond Area). Due to these observations and the presence of wetland habitat within the Terrace Point Area, tricolored blackbirds have a potential to occur in the proposed Program area.

Therefore, proposed Program construction has the potential to remove foraging and nesting habitat and indirectly affect resident and migratory raptors in adjacent habitat at the Terrace Point Area. The removal of active nests is prohibited by CDFG code and the Migratory Bird Treaty Act (see Regulatory Framework section, above).

Conveyance and Pumping Facilities

Activities associated with proposed Program construction, including pipeline and pump installation, could result in disturbance to nesting birds or other indirect impacts to biological resources.

Alternative D-2

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Indirect impacts, such as disturbance to nesting birds, could occur as a result of pipeline and pumping facility construction, depending on the location of these facilities.

Mitigation Measures

Mitigation Measure 5.4-2: This mitigation measure applies to all proposed Program components, except for the desalination facility if it is located at the Industrial Park Area. A qualified biologist shall conduct preconstruction surveys for nesting raptors throughout the proposed Program area, and for yellow warbler wherever riparian vegetation is within 30 meters (100 feet) of construction activities. If any of these species are present within or adjacent to the study area, the City shall design and implement measures to avoid impacts, in coordination with CDFG.

- To reduce potential direct and indirect impacts (i.e., disturbance, nest abandonment, nest site [tree] removal) to nesting raptors during the breeding season (February 1 through August 31), preconstruction surveys for nesting raptors shall be conducted by a qualified biologist. Known or suspected raptor nesting sites within 100 meters (328 feet) of the construction site shall be flagged. Additionally, preconstruction nesting surveys for yellow warbler shall be conducted wherever construction activities would occur within 30 meters (100 feet) of riparian vegetation. Known or suspected yellow warbler nest locations shall be flagged.
- Surveys shall be conducted no more than two weeks prior to the onset of construction activities.
- Construction shall be prohibited within 30 meters (100 feet) of yellow warbler nests, and 100 meters (328 feet) of active raptor nests until chicks have fledged (actual time to be determined by qualified biologist). To further reduce potential impacts on nesting birds, all grading and tree removal shall occur outside of the nesting season.
- To reduce any permanent impacts to nesting avian species, no riparian or wetland vegetation shall be removed from the proposed desalination areas.

Significance After Mitigation: Less than Significant.

Impact 5.4-3: Construction of the proposed Program components could result in impacts to special-status reptiles and amphibians: southwestern pond turtle, California red-legged frog, and foothill yellow-legged frog. Less than Significant after EIR-Identified Mitigation.

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant

The aquatic habitat needed by these special-status reptiles and amphibians occurs primarily adjacent to the study area. None of the potential desalination areas support adequate habitat for foothill yellow-legged frog. Antonelli's Pond is a known location for California red-legged frog and southwestern pond turtle. Therefore, both species could occur in habitats adjacent to the desalination areas near Antonelli's Pond (Terrace Point Area and Shaffer Road/Antonelli's Pond Area). However, the proposed areas themselves do not contain suitable breeding habitat for California red-legged frog due to the lack of water and emergent vegetation, or for western pond turtle due to the lack of upland vegetation and sandy soils. Therefore, there would be no direct impact to California red-legged frogs and southwestern pond turtles due to habitat removal. However, the potential exists for direct impacts due to construction activities if individuals of either species move through the construction area at the time of construction. Clearing and grading could cause indirect impacts, such as increased sedimentation into Antonelli's Pond.

Conveyance and Pumping Facilities

The pipeline corridors run either across or parallel to potential special-status reptile and amphibian habitat. D-1 (Corridor 2) runs parallel to Moore Creek, which is known habitat for California red-legged frog and western pond turtle. Therefore, construction activities could result in indirect impact, such as increased sedimentation or pollution.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. The pipeline corridors run either across or parallel to potential special-status reptile and amphibian habitat.

Mitigation Measures

Mitigation Measure 5.4-3a: This mitigation measure applies to all proposed Program components. The City shall hire a qualified biologist to conduct preconstruction surveys for California red-legged frog and western pond turtle within the desalination areas and adjacent habitats. If this species is present within or adjacent to the study area or adjacent habitat, the City shall design and implement measures to avoid impacts, in coordination with CDFG.

Mitigation Measure 5.4-3b: The City shall require the use of standard best management practices (BMPs) and erosion control measures throughout construction of the proposed Program components to prevent increased discharge of sediment and/or pollutants into aquatic habitats. See Mitigation Measure 5.1-1 (Section 5.1, Hydrology and Water Quality).

Standard erosion control devices and BMP methods include but are not limited to:

- Erosion control to stabilize disturbed soils (cover vegetation, mulching, erosion control fabric, etc.)
- Installation of sediment capture devices at strategic locations (sediment control "silt" fencing, weed-free straw bales, straw wattles)
- Storage of hazardous material at least 200 feet away from a drainage or water body
- Restriction of refueling of mobile and/or portable equipment to areas more than 100 feet away from a drainage (including riparian vegetation) or water body
- Use of catch bases and absorbent pads for refueling of sedentary equipment within 100 feet of a drainage (including riparian vegetation) or water body

Significance After Mitigation: Less than Significant.

⌧ **Impact 5.4-4: Construction of the proposed Program components could result in impacts to special-status mammals. Less than Significant with EIR-Identified Mitigation.**

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

No special-status mammal species were observed in the proposed Program area, and no suitable habitat occurs within the study area. However, riparian habitat occurring along Moore Creek (close to Corridor 2) and Antonelli's Pond may provide habitat for the San Francisco dusky-footed woodrat adjacent to the study site (i.e., Shaffer Road/Antonelli's Pond Area or the Terrace Point Area). Impacts could occur if this species wanders onto the construction site at night and becomes trapped in any open holes within the construction area. Surveys have not yet been conducted; however, preconstruction surveys would be required for the selected program components prior to implementation to identify potentially sensitive species.

Mitigation Measure 5.4-4a: This mitigation measure applies to all proposed Program components. As part of the preconstruction surveys, the City shall hire a qualified biologist to survey for special-status mammals at riparian areas along the selected routes.

Mitigation Measure 5.4-4b: This mitigation measure applies to all proposed Program components. All open holes, trenches, or pits shall be covered overnight and when not in use to avoid any wildlife (e.g., San Francisco dusky-footed woodrat) being trapped. If any wildlife are found trapped within construction work areas, a qualified biologist shall remove the animal and transport it to a safe location.

Significance After Mitigation: Less than Significant.

⌧ **Impact 5.4-5: Construction activities associated with D-2 pipeline could result in impacts to coastal steelhead (ESU). Less than Significant after EIR-Identified Mitigation.**

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

Central California coast steelhead (ESU) are known to occur within Arana Gulch, San Lorenzo River, and Soquel Creek. Construction activities associated with D-2 pipeline installation have a potential to affect steelhead due to increased sediment and/or pollutants discharged into steelhead habitat during clearing and grading.

Mitigation Measures

Please refer to Mitigation Measures 5.4-3b and 5.1-1.

Standard erosion control devices and BMPs shall be deployed to reduce sediment and erosion impacts to waterways and would therefore protect fish resources.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.4-6:. Construction and continuing operations of the proposed Program could result in increased pollution and/or sedimentation into adjacent wetlands and/or waters of the U.S. Less than Significant with EIR-Identified Mitigation**

General Discussion (Applicable to both Alternatives)

Proposed Program construction (i.e., grading, earthmoving, vegetation removal, boring, trenching, ripping) has the potential to increase erosion and/or contribute sediment into adjacent wetlands and/or tributaries of waters of the U.S.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant Location

Industrial Park Area. Seasonal wetlands occur within and adjacent to the Industrial Park Area near Lipton Ditch and the southwest portion of the area. However, the majority of the area is heavily disturbed and composed primarily of non-native grassland.

Shaffer Road/Antonelli's Pond Area. Seasonal wetlands are present adjacent to the Shaffer Road/Antonelli's Pond Area, in the Moore Creek corridor, within Antonelli's Pond, and scattered throughout the undeveloped area between Shaffer Road, Delaware Road, Natural Bridges Drive, and Highway 1 corridor. Moore Creek could be considered waters of the U.S. by the Corps, since it ultimately empties into the Pacific Ocean. Construction activities in this area have the potential to affect adjacent wetlands and or/waters of the U.S. due to sedimentation or pollution.

Terrace Point Area. Seasonal and estuarine wetlands occur within the Terrace Point Area. Depending on the location of the proposed desalination plant, construction activities have the potential to affect wetlands due to pollution or sedimentation.

Conveyance and Pumping Facilities

Pipeline corridors run either across or parallel to wetlands and/or waters of the U.S. The potential exists for impacts to wetlands and/or waters of the U.S. due to open-trench construction or indirect impacts due to increased sedimentation or pollution as a result of construction activities.

If open-trench construction for pipeline installation occurs within wetlands and/or waters of the U.S. or detention basins and/or erosion control structures are constructed within these resources, these activities could be considered discharges of fill by the Corps and would require a Clean Water Act Section 404 permit and a Section 401 water quality certification. In addition, any basins or structures constructed within or under a stream channel (i.e., underground pipelines, access boxes) could require a Section 1602 California Fish and Game Code streambed alteration agreement.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Pipeline corridors run either across or parallel to wetlands and/or waters of the U.S. The potential exists for impacts to wetlands and/or waters of the U.S. due to increased sedimentation or pollution as a result of construction activities.

<u>Mitigation Measures</u>

Mitigation Measure 5.4-6a: This mitigation measure applies to the desalination plant component. As part of preconstruction surveys, the City shall hire a qualified biologist to conduct a habitat assessment (including wetlands) of the selected desalination area. The City shall locate the plant site outside of sensitive habitat to avoid impacts to wetlands. To the extent feasible, the City shall use special pipeline crossing construction techniques or limit construction activities to special construction periods at drainages to avoid impacts to wetlands and/or waters of the U.S.

Mitigation Measure 5.4- 6b: This mitigation measure applies to all proposed Program components. The City shall obtain any necessary permits from responsible agencies (e.g., the Corps, RWQCB, and CDFG) prior to construction. All permit conditions and/or requirements shall be implemented. Contractors shall construct and maintain adequate erosion control devices and practices following standard BMPs.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.4-7: Construction activities have the potential to impact loggerhead shrike, Ohlone tiger beetle, monarch butterfly, and Smith's blue butterfly. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Several special-status species are reported in the CNDDB as occurring within the study area vicinity, including the loggerhead shrike, Ohlone tiger beetle, monarch butterfly, and Smith's blue butterfly. Loggerhead shrike is only expected as a winter visitor and therefore impacts to this species are considered less than significant. Ohlone tiger beetle is found in native grasslands. As native grasslands do not occur within the study area, no impact to Ohlone tiger beetle is anticipated. Although monarch butterflies are known to winter over at the Natural Bridges State Park, there is no suitable monarch butterfly habitat within the study area due to the lack of large tree stands. Therefore, there is no impact to monarch butterfly. Smith's butterfly is found primarily in coastal scrub habitats where cliff buckwheat grows. This habitat does not occur in the study area. Therefore, no impacts to Smith's blue butterfly would occur.

Mitigation: None required.

Impact 5.4-8: Groundwater extraction from the Live Oak wells has the potential to impact biological resources through reduction of surface water flow in local creeks, rivers, coastal lagoons, and estuaries. No Impact.

Alternatives D-1 and D-2 (Applicable to First and Future Increments of Both Alternatives.

The nearest water features to the Beltz Wells are Rodeo Creek (approximately 1,000 feet from Beltz Well No. 7), Soquel Creek, Moran Lake, Corcoran Lagoon, Schwann Lake, and Rodeo Creek. The City's well field is a considerable distance from all other sensitive surface water features, and is located at the lowest end of the watershed where groundwater extraction is from water that would normally become part of offshore flow. Under Alternatives D-1 and D-2, the planned use of groundwater from the Live Oak well field is consistent with historical use. Historically, the City has used the groundwater during a period of 150 to 200 days out of the year at a combined operational rate of about 1 mgd on average but at 2 mgd during the extended drought in 1987 and 1988. Impacts associated with groundwater extraction for all project alternatives would have a less-than-significant impact on surface waters including streams, coastal lagoons and estuaries (see Section 5.1, Hydrology and Water Quality). Therefore the impacts of groundwater extraction on biological resources associated with local surface water bodies is less than significant.

Mitigation Measure: None Required

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5.5 AIR QUALITY

5.5.1 Introduction

Air quality in a region is determined by its topography, meteorology, and air pollutant sources. These factors, including pertinent characteristics of the air basin and the physical conditions affecting pollutant dispersion in the North Central Coast Air Basin (NCCAB) area, are discussed below. In addition, current regulatory framework that applies to the NCCAB pursuant to the regulatory authority of the Monterey Bay Unified Air Pollution Control District (MBUAPCD) are provided. Following a description of existing conditions and regulations, potentially significant impacts associated with the proposed Program are identified, along with mitigation measures to reduce potential impacts

5.5.2 Existing Conditions

Climate and Meteorology

Ambient air quality is commonly characterized by climatological conditions, the meteorological influences on air quality, and the quantity and type of pollutants released. The Santa Cruz area is subject to a combination of topographical and climatic factors that reduce the potential for high levels of regional and local air pollutants. As described in Section 5.1, Hydrology and Water Quality, the study area's climate is characterized by warm, dry summers and mild, rainy winters. High temperatures and low precipitation are prevalent from approximately April through August and are caused by high-pressure belts drifting northwards from the subtropics. The months from November through March are dominated by cooler temperatures and heavy rains caused by low-pressure depressions as high-pressure belts retreat. Though winters are typically mild, colder winds from inland regions of continental climates can lead to short-term cold periods in the area. Both summer and winter temperatures are moderated by the oceanic influence, with summer fog being a common occurrence.

Regional Setting

Santa Cruz County is located within the NCCAB, which consists of Monterey, Santa Cruz, and San Benito Counties. The basin lies along the central coast of California and covers approximately 5,159 square miles.

The northwest sector of the basin is dominated by the Santa Cruz Mountains, while the northeastern boundary is marked by the Diablo Range. The Diablo Range and the southern extent of the Santa Cruz Mountains form the Santa Clara Valley. The Santa Clara Valley extends into the northeastern tip of the NCCAB. There, it evolves into the San Benito Valley, which trends northwest–southeast . The Gabilan Range forms the valley's western boundary. West of the Gabilan Range is the Salinas Valley, which extends from Salinas at the northwest end to King City at the southeast end. The Sierra de Salinas forms the western side of the Salinas Valley and the eastern side of the smaller Carmel Valley; the coastal Santa Lucia Range defines the western side of the valley (MBUAPCD 2004a).

The semipermanent high-pressure cell in the eastern Pacific (Pacific High) is the basic controlling factor in the climate of the air basin. In the summer, the high-pressure cell dominates to cause persistent west and northwest winds over the entire California coast. Air descends in the Pacific High and forms a stable temperature inversion of hot air over a cool coastal layer of air. The onshore air currents pass over cool ocean waters to bring fog and relatively cool air into the coastal valleys. The warmer air acts as a lid to inhibit vertical air movement within the basin.

The generally northwest–southeast orientation of the mountains tends to restrict and channel the summer onshore air currents. Surface heating in the interior portion of the Salinas and San Benito Valleys creates a weak low pressure that intensifies the onshore airflow during the afternoon and evening.

In the fall, the surface winds become weak, and the marine layer grows shallow, dissipating altogether on some days. The airflow is occasionally reversed in a weak offshore movement, and the relatively stationary air mass is held in place by the Pacific High, which allows pollutants to build up over a period of a few days. It is most often during this season that the north or east winds develop, transporting pollutants from either the San Francisco Bay Area or the Central Valley into the NCCAB.

During the winter, the Pacific High migrates southward and has less influence on the air basin. Winds flow in a southeasterly direction out of the Salinas and San Benito Valleys, especially during night and morning hours. Northwest winds nevertheless remain dominant in winter, although easterly flow is more frequent. The general absence of deep, persistent inversions and the occasional storm systems usually result in good air quality for the basin as a whole in winter and early spring.

Study Area

In Santa Cruz County, coastal mountains exert strong influence on atmospheric circulation and result in generally good air quality. Small inland valleys with low mountains on two sides (e.g., Scotts Valley) have poorer circulation than Santa Cruz has on the coastal plain. Scotts Valley is downwind of major pollutant generating centers, and these pollutants form oxidants while in transit to Scotts Valley. Consequently, air pollutants tend to build up more at Scotts Valley than at Santa Cruz (MBUAPCD 2002a).

The climate of the study area is characterized by mild, rainy winters and cool, dry summers. Daily and seasonal temperature ranges are small, and humidity is relatively high. Summer coastal fog is common in the area, generally occurring from June through September. The average annual mean temperature at the monitoring station is 57.0 degrees Fahrenheit (˚F). The average low temperature is 39.2˚F (January) and the summer high temperature is 75.9˚F (September). The annual rainfall at the Santa Cruz station is 30.5 inches. The majority of annual rainfall in the region occurs from the month of October through the month of April (WRCC 2003).

The prevailing wind direction in the region is from the northwest; these winds also have the highest average wind speeds (10 to 15 miles per hour). These winds result from the Pacific High during the summers, which produce northwest winds all along the California coast. During winter, the Pacific High moves southward, allowing ocean-formed storms through the region. Average wind speeds through the City are 5 to 6 miles per hour.

Criteria Pollutants

"Air pollutants" is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants may adversely affect human or animal health, reduce visibility, damage property, and reduce the productivity or vigor of crops and natural vegetation.

Seven air pollutants have been identified by the EPA as being of concern nationwide: carbon monoxide (CO); ozone (O_3); nitrogen dioxide (NO_2); respirable particulate and suspended particulate equal to or less than 10 microns in size (PM_{10}); fine particulate matter equal to or less than 2.5 microns in size ($PM_{2.5}$); sulfur dioxide (SO_2); and lead (Pb). These pollutants are collectively referred to as criteria pollutants. The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably.

Ambient concentrations of CO, O_3, and Pb are primarily influenced by motor vehicle activity. Emissions of sulfur oxides (SO_X), which include SO_2, are associated mainly with various stationary sources. Emissions of nitrogen oxides (NO_X), which include NO_2, and particulate matter come from both mobile and stationary sources.

<u>Ozone</u>

O_3 is the principal component of smog and is formed in the atmosphere through a series of reactions involving reactive organic gases (ROG) and NO_X in the presence of sunlight. ROG and NOx emissions are both considered critical in O_3 formation and are therefore called precursors of O_3; NO_X includes various combinations of nitrogen and oxygen, including NO, NO_2, NO_3, etc. O_3 is a principal cause of lung and eye irritation in the urban environment. Significant O_3 concentrations are normally produced only in the summer, when atmospheric inversions are greatest and temperatures are high. Control strategies for O_3 have focused on reducing emissions from vehicles, from industrial processes using solvents and coatings, and from consumer products. Volatile organic compounds (VOC), and ROG, means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Both the EPA and the California Air Resources Board (ARB) exempt certain chemicals from this definition; the primary difference is that the ARB exempts fewer chemicals than the EPA from consideration.

Respirable Particulate Matter

Particulate matter includes both liquid and solid particles of a wide range of sizes and composition. While some PM_{10} comes from automobile exhaust, the principal sources in Santa Cruz County are dust from construction, agriculture, and from the action of vehicle wheels on paved and unpaved roads. In other areas, wind-blown sand and fireplaces can be important sources. PM_{10} can cause increased respiratory disease, lung damage, and premature death. Control of PM_{10} is achieved through the control of dust at construction sites, the cleaning of paved roads, and the wetting or paving of frequently used unpaved roads.

Fine Particulate Matter

The sources, health effects, and control of $PM_{2.5}$ are similar to those of PM_{10}. In 1997, the EPA determined that the health effects of $PM_{2.5}$ were severe enough to warrant an additional standard.

Carbon Monoxide

CO is a colorless and odorless gas that, in the urban environment, is associated primarily with the incomplete combustion of fossil fuels in motor vehicles. Relatively high concentrations are typically found near crowded intersections and along heavily used roadways carrying slow-moving traffic. Even under the severest meteorological and traffic conditions, high concentrations of CO are limited to locations within a relatively short distance (91 to 183 meters, or 300 to 600 feet) of heavily traveled roadways. Overall CO emissions are decreasing as a result of the Federal Motor Vehicle Control Program, which has mandated increasingly lower emission levels for vehicles manufactured since 1973. CO concentrations are typically higher in winter. As a result, California has required the use of oxygenated gasoline in the winter months to reduce CO emissions.

Nitrogen Dioxide

NO_2 is a product of combustion and is generated in vehicles and in stationary sources, such as power plants and boilers. NO_2 can cause lung damage. As noted above, NO_2 is part of the NO_X family and is a principal contributor to O_3 and smog.

Sulfur Dioxide

SO_2 is a combustion product, with the primary source being power plants and heavy industry that use coal or oil as fuel. SO_2 is also a product of diesel engine combustion. The health effects of SO_2 include lung disease and breathing problems for asthmatics. SO_2 in the atmosphere contributes to the formation of acid rain. In the Bay Area, there is relatively little use of coal and oil; therefore, SO_2 is of lesser concern than in many other parts of the country.

Diesel Exhaust Emissions

In 1999, the California ARB identified particulate emissions from diesel-fueled engines as a toxic air contaminant (TAC) (ARB 2000). Once a substance is identified as a TAC, the ARB is required by law to determine if there is a need for further control. This is referred to as risk management.

Ongoing studies at ARB are analyzing both stationary and mobile diesel engine sources, as well as many other aspects of diesel exhaust emissions. On September 28, 2000, the ARB approved the *Proposed Diesel Risk Reduction Plan* and the *Proposed Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*. Other programs in progress relating to truck emissions are described below.

In February 2001, the EPA issued new rules requiring cleaner diesel fuels in 2006 and beyond. However, since 1993, California's regulations have required cleaner diesel fuel than the federal requirements. The 1993 federal regulations reduced particulate emissions by 5 percent, while the California regulations reduced particulate emissions by 25 percent.

The control of emissions from mobile sources is a statewide responsibility of the ARB that has not been delegated to the local air districts. No standard exists for quantitative impact analysis for diesel particulates. Some air districts have issued preliminary guidance for projects with large or concentrated numbers of trucks, such as warehouses and distribution facilities.

Odors

The odor detectability threshold consists of the detection threshold and recognition threshold. The detection threshold is the lowest concentration of an odor that will elicit a sensory response; at this concentration there is an awareness of the presence of an added substance, but not necessarily an odor sensation. The recognition threshold, however, is the minimum concentration that is recognized as having a characteristic odor quality by a population. Odor intensity refers to the perceived strength of the odor sensation. Odor character is what the substance smells like (e.g., fishy, rancid, hay, sewer, turpentine, ammonia, etc.). Each of these elements plays a role in the identification of odor impacts.

Existing Air Quality

Monitoring Data

Air pollutant concentrations are measured at monitoring stations throughout the NCCAB. Baseline air quality in the study area can be inferred from ambient air quality measurements conducted at the Santa Cruz and Davenport monitoring stations. The Santa Cruz monitoring station records the following pollutants: O_3, PM_{10}, and $PM_{2.5}$. Measurements for CO and NO_2 are taken from the Davenport monitoring station. The Santa Cruz monitoring station is located at 2544 Soquel Avenue in the city of Santa Cruz, California, and the Davenport monitoring station is located at Marine View and Center Avenue in the city of Davenport, California. The Santa Cruz monitoring station is the closest station to the study area that is representative of the air quality in the city. Table 5.5-1 summarizes the last four years of published data from these monitoring stations for O_3, CO, NO_2, PM_{10}, and $PM_{2.5}$.

Table 5.5-1
Ambient Air Quality Summary, Santa Cruz and Davenport[3] Monitoring Stations

POLLUTANT	AVERAGING TIME	CALIFORNIA AIR QUALITY STANDARDS	FEDERAL PRIMARY STANDARDS	MAXIMUM CONCENTRATIONS[1]					NUMBER OF DAYS EXCEEDING FEDERAL STANDARD[2]					NUMBER OF DAYS EXCEEDING STATE STANDARD [2]				
				1998	1999	2000	2001	2002	1998	1999	2000	2001	2002	1998	1999	2000	2001	2002
Oxidants (Ozone)	1 hour 8 hours	9 pphm none	12 pphm 8 pphm	8.1 –	9.7 7.2	7.9 6.1	7.6 6.0	8.1 6.0	0 –	0 0	0 0	0 0	0 0	0 –	1 –	0 –	0 –	0 –
Carbon Monoxide[3]	1 hour 8 hours	20 ppm 9 ppm	35 ppm 9 ppm	– 8.6	– 7.5	– 7.8	– 10.1	– 8.1	– 0	– 0	– 0	– 0	– 0	– 0	– 0	– 0	– 0	– 0
Nitrogen Dioxide[3]	1 hour Annual	25 pphm none	none 5.3 pphm	3.9 0.4	3.2 0.5	3.5 0.5	4.2 0.5	3.5 0.5	– 0	– 0	– 0	– 0	– 0	0 –	0 –	0 –	0 –	0 –
PM_{10}	24 hours Annual/AAM[4] Annual/AGM[4]	50 µg/m^3 none 30 µg/m^3	150 µg/m^3 50µg/m^3 none	34 16.9 15.6	47 19.3 17.5	30 16.2 14.3	35 18.6 17.1	41 17.9 16.0	0 0 –	0 0 –	0 0 –	0 0 –	0 0 –	0 – 0	0 – 0	0 – 0	0 – 0	0 – 0
$PM_{2.5}$	24 Hours Annual/AAM[4]	– 12µg/m^3	65µg/m^3 15µg/m^3	– –	31.3 9.4	23.3 7.9	23.1 9.1	22.8 8.6	– –	0 0	0 0	0 0	0 0	– –	– 0	– 0	– 0	– 0

Source: ARB 2003

[1] *Concentration units for ozone and nitrogen dioxide are in parts per hundred million (pphm). Concentration units for carbon monoxide and sulfur dioxide are in parts per million (ppm). Concentration units for PM_{10} and $PM_{2.5}$ are in micrograms per cubic meter ($\mu g/m^3$).*

[2] *For annual standards, a value of 1 indicates that the standard has been exceeded. For PM_{10}, calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.*

[3] *CO and NO2 data were obtained from the Davenport monitoring station.*

[4] *AAM = annual arithmetic mean; AGM = annual geometric mean;*

dash (–) = data not available or applicable.

Toxic Air Contaminant Sources

One USEPA study provides a general idea of the relative importance of community air toxics sources in terms of health risk (USEPA 1989). This study, which considered cancer-related health risk due to air toxics in five cities, evaluated the relative contribution to cancer incidence of a number of common city sources of air toxics. Motor vehicles were found to cause more than one-half the air-toxics-related health risk in the cities studied. Industrial sources, such as chrome plating businesses, solvent users, and other manufacturers, were responsible for more than one-fifth of the identified risk. Other common community sources, such as fireplaces, gasoline stations, and hospital sterilizers, made up about 10 percent of the risk.

Attainment Status

Monitored criteria pollutants are classified in each air basin, county, or, in some cases, within a specific urbanized area. The classification is determined by comparing actual monitoring data with state and federal standards. These standards are described under the regulatory framework section. If a pollutant concentration is lower than the standard, the pollutant is classified as "attainment" in that area. If an area exceeds the standard, the pollutant is classified as "nonattainment." If data are insufficient to determine whether or not the standard is exceeded, the area is designated "unclassified."

Additionally, the state uses the designation "nonattainment transitional," which is a subcategory of the nonattainment designation. An area is designated nonattainment transitional to signify that the area is close to attaining the standard for that pollutant. Special requirements, as described under the Regulatory Framework section below, are applicable where "nonattainment" has been assigned.

The NCCAB is designated as a nonattainment transitional area for the state O_3 standard and as a state nonattainment area for PM_{10} (MBUAPCD 2004b). The NCCAB is in attainment for the state CO, SO_2, sulfates, and Pb standards, and unclassified for state hydrogen sulfide and visibility-reducing particles. The NCCAB is designated as an attainment area for all federal criteria pollutants.

Odor Sources

Within the city, there are many sources of odors including, but not limited to, food preparation at restaurants, exhaust from automobiles on local roadways, fueling operations at gas stations, and wastewater treatment plants.

5.5.3 Regulatory Framework

Air quality is regulated by several jurisdictions including USEPA, ARB, and MBUAPCD. Each of these jurisdictions develops rules, regulations, policies, and/or goals to attain the goals or directives imposed upon them through legislation. Although USEPA regulations may not be superseded, both state and local regulations may be more stringent.

One of the most important reasons for air quality standards is the protection of those members of the population who are most sensitive to the adverse health effects of air pollution, termed “sensitive receptors.” The term sensitive receptors refers to specific population groups, as well as the land uses where they would reside for long periods. Commonly identified sensitive population groups are children, the elderly, the acutely ill, and the chronically ill. Commonly identified sensitive land uses are residences, schools, playgrounds, childcare centers, retirement homes or convalescent homes, hospitals, and clinics. The federal and state standards for the criteria pollutants and other state-regulated air pollutants are shown in Table 5.5-2.

Federal Air Quality Regulations

The 1970 federal Clean Air Act authorized the establishment of national, health-based air quality standards and set deadlines for their attainment. The federal Clean Air Act Amendments of 1990 (1990 CAAA) made major changes in deadlines for attaining National Ambient Air Quality Standards (NAAQS) and in the actions required of areas of the nation that exceeded these standards. The 1990 CAAA requires designated agencies in any area of the nation that does not meet the NAAQS to prepare a plan demonstrating the steps that will be taken to bring the area into

Table 5.5-2
California and National Ambient Air Quality Standards

POLLUTANT	AVERAGING TIME	NAAQS[1]		CAAQS[2]
		PRIMARY[3]	SECONDARY[4]	CONCENTRATION[5]
Ozone (O_3)[6]	1-Hour	0.12 ppm (235 µg/m^3)	Same as Primary Standard	0.09 ppm (180 µg/m^3)
	8-Hour	0.08 ppm		—
Carbon Monoxide (CO)	8-Hour	9.0 ppm (10 µg/m^3)	None	9.0 ppm (10 µg/m^3)
	1-Hour	35 ppm (40 µg/m^3)		20 ppm (23 µg/m^3)
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)	Same as Primary Standard	—
	1-Hour	—		0.25 ppm (470 µg/m^3)
Sulfur Dioxide (SO_2)	Annual Average	80 µg/m^3 (0.03 ppm)	—	—
	24-Hour	365 µg/m^3 (0.14 ppm)	—	0.04 ppm (105 µg/m^3)
	3-Hour	—	1300 µg/m^3 (0.5 ppm)	—
	1-Hour	—	—	0.25 ppm (655 µg/m^3)
Suspended Particulate Matter (PM_{10})	24-Hour	150 µg/m^3	Same as Primary Standard	50 µg/m^3
	Annual Arithmetic Mean	50 µg/m^3		20 µg/m^3 note 7

(table continued on next page)

Table 5.5-2 (continued)
California and National Ambient Air Quality Standards

POLLUTANT	AVERAGING TIME	NAAQS[1]		CAAQS[2]
		PRIMARY[3]	SECONDARY[4]	CONCENTRATION[5]
Fine Particulate Matter ($PM_{2.5}$)[6]	24-Hour	65 $\mu g/m^3$	Same as Primary Standard	—
	Annual Arithmetic Mean	15 $\mu g/m^3$		12 $\mu g/m^3$ note 7
Lead (Pb)	30-Day Average	—	—	1.5 $\mu g/m^3$
	Calendar Quarter	1.5 $\mu g/m^3$	Same as Primary Standard	—
Hydrogen Sulfide (HS)	1-Hour	No Federal Standards		0.03 ppm (42 $\mu g/m^3$)
Sulfates (SO_4)	24-Hour			25 $\mu g/m^3$
Visibility-Reducing Particles	8-Hour (10 a.m. to 6 p.m., Pacific Standard Time)			In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.

Source: www.arb.ca.gov

[1] *National Ambient Air Quality Standards (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The O_3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when 99 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the USEPA for further clarification and current federal policies.*

[2] *California Ambient Air Quality Standards for O_3, CO (except Lake Tahoe), SO_2 (1 and 24 hours), NO_2, PM_{10}, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded.*

[3] *National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.*

[4] *National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.*

[5] *Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25^0C and a reference pressure of 760 millimeters (mm) of mercury. Most measurements of air quality are to be corrected to a reference temperature of 25^0C and a reference pressure of 760 mm of mercury (1,013.2 millibar). In this table, ppm refers to ppm by volume or micromoles of pollutant per mole of gas.*

[6] *New federal 8-hour ozone and fine particulate matter standards were promulgated by USEPA on July 18, 1997. The federal 1-hour O_3 standard continues to apply in areas that violated the standard. Contact USEPA for further clarification and current federal policies.*

[7] *On June 5, 2003, the Office of Administrative Law approved the amendments to the regulations for the state ambient air quality standards for particulate matter and sulfates. Those amendments established a new annual average standard for $PM_{2.5}$ of 12 $\mu g/m^3$ and reduced the level of the annual average standard for PM_{10} to 20 $\mu g/m^3$. The approved amendments were filed with the Secretary of State on June 5, 2003. The regulations became effective on July 5, 2003.*

compliance. The 1990 CAAA completely revised the federal statute, providing a new timeframe for attaining NAAQS and a new set of guidelines and planning processes for carrying out the requirements of the Amendments.

State Air Quality Regulations

The California Clean Air Act (CCAA) requires that all air districts in the state endeavor to achieve and maintain California Ambient Air Quality Standards (CAAQS) for all criteria pollutants by the earliest practical date. The CCAA specifies that districts focus particular attention on reducing the emissions from transportation and areawide emission sources, and the act provides districts with new authority to regulate indirect sources. Each district must plan to achieve a 5 percent annual reduction, averaged over consecutive three-year periods, in districtwide emissions of each nonattainment pollutant or its precursors.

Monterey Bay Unified Air Pollution Control District Requirements

The MBUAPCD is responsible for implementing emissions standards and other requirements of federal and state laws regarding most types of stationary emission sources. The MBUAPCD regulates air quality in Santa Cruz and the rest of the NCCAB through its permit authority and its planning and review activities.

As required by the CCAA, the MBUAPCD adopted the 1991 Air Quality Management Plan (AQMP) for the Monterey Bay Region. In a continuing effort to reach attainment of the state standards for O_3, and as required by the CCAA, the MBUAPCD updated the AQMP in 1997 and 2000. The AQMP stresses attainment of O_3 standards and focuses on strategies reducing NO_X and ROG air emissions by promoting active public involvement, by encouraging compliance through positive influences and behavior, and through public education in both the public and private sectors. Specific planning efforts related to PM_{10} are contained in the MBUAPCD's 1998 report, *Attainment of the California Particulate Matter Standards in the Monterey Bay Region*. The proposed Program is required to comply with these plans, and conformance will be incorporated into project specifications and procedures.

The MBUAPCD has also developed *CEQA Air Quality Guidelines* to facilitate air quality review and evaluation of projects that are subject to CEQA. The guidelines are intended to provide lead agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality section of environmental documents.

City of Santa Cruz General Plan and Local Coastal Program

The City of Santa Cruz adopted an Air Quality Element as part of its General Plan. Through the development of the Air Quality Element, Santa Cruz supports the efforts of the MBUAPCD through eight policies. These policies are provided in Appendix B of this EIR.

Santa Cruz County General Plan and Local Coastal Program

The County of Santa Cruz adopted an Air Quality Element as part of its General Plan. Through the development of the Air Quality Element, the County supports the efforts of the MBUAPCD through 10 policies. These policies are provided in Appendix B of this Draft EIR.

City of Capitola General Plan

The City of Capitola includes an Air Quality section in its adopted General Plan. Capitola supports the efforts of the MBUAPCD and will work to assure attainment of both federal and state ambient air quality standards.

Coastal Act Policy

Policy 30253(3) of the Coastal Act requires that new development be consistent with requirements imposed by an air pollution control district or the state ARB as to each particular development.

5.5.4 Impacts and Mitigation Measures

This section presents an analysis of the impacts and provides mitigation measures for temporary air quality impacts during construction and long-term impacts associated with operation of the desalination facilities. Mitigation measures are provided to reduce potentially significant impacts.

Significance Criteria

<u>Appendix G Thresholds of Significance</u>

In accordance with Appendix G of the *CEQA Guidelines*, the proposed Program would have a significant impact to air quality if they would:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is classified as in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

<u>Monterey Bay Unified Air Pollution Control District</u>

The MBUAPCD's thresholds of significance are used to determine if a project would result in a significant air quality impact. Using the MBUAPCD's 2004 *CEQA Air Quality Guidelines* (June 2004), significant air quality impacts are measured as follows:

Construction Impacts. Construction activities (e.g., excavation, grading, on-site vehicles) that directly generate 82 pounds per day or more of PM_{10} would have a significant impact on local air quality when they are located nearby and upwind of sensitive receptors. Construction projects using typical construction equipment such as, dump trucks, scrapers, bulldozers, compactors, and front-end loaders that temporarily emit precursors of ozone (i.e., ROG or NO_X),are accommodated in the emission inventories of state and federally required air plans and would not have a significant impact on the attainment and maintenance of ozone standards. The MBUAPCD should be consulted regarding emissions from nontypical equipment, such as grinders and large pieces portable equipment.

Long-Term Impacts. Emissions from long-term operations generally represent a project's most substantial air quality impact. Table 5.5-3 summarizes the thresholds of significance for operational impacts, by pollutant. An exceedance of any threshold would represent a significant impact on local or regional air quality.

Table 5.5-3
Thresholds of Significance for Criteria Pollutants of Concern Operational Impacts[1]

POLLUTANT	THRESHOLDS OF SIGNIFICANCE
VOC	137 lb/day (direct + indirect)
NOx, as NO_2	137 lb/day (direct + indirect)
PM_{10}	82 lb/day (on-site)[2]
	AAQS exceeded along unpaved roads (offsite)
CO	550 lb/day (direct)[3]
	Level of service (LOS) at intersection/road segment degrades from D or better to E or F; volume-to-capacity ratio at intersection/road segment at LOS E or F increases by 0.05 or more; delay at intersection at LOS E or F increases by 10 seconds or more; or reserve capacity at unsignalized intersection at LOS E or F decreases by 50 or more.[3]
SOx, as SO_2	150 lb/day (direct) [2]

Source: Monterey Bay Unified Air Pollution Control District 2002

1 *Projects that emit other criteria pollutant emissions would have a significant impact if emissions would cause or substantially contribute to the violation of state or national AAQS. Criteria pollutant emissions could also have a significant impact if they would alter air movement, moisture, temperature, climate, or create objectionable odors in substantial concentrations. When estimating project emissions, local or project-specific conditions should be considered.*

2 *MBUAPCD-approved dispersion modeling can be used to refute (or validate) a determination of significance if modeling shows that emissions would not cause or substantially contribute to an exceedance of state and national AAQS*

3 *Modeling should be undertaken to determine if the project would cause or substantially contribute (550 lb/day) to exceedance of CO AAQS. If not, the project would not have a significant impact.*

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts differ between the alternatives. Evaluation of impacts associated with subsequent expansion is also provided where relevant. Table 5.5-4 summarizes potentially significant impacts.

Table 5.5-4
Summary of Potential Impacts – Air Quality

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILTY		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITY	INDUSTRIAL PARK	SHAFFER ROAD /ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITY
Impact 5.5-1: The proposed Program could conflict with or obstruct implementation of the applicable air quality plan.	○	○	○	○	--	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.5-2: Violate air quality standard or contribute substantially to an existing or projected air quality violation.	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.5-3: Expose sensitive receptors to substantial pollutant concentrations.	◐	◐	--	--	--	--	◐	◐	◐	--	--	--	--	--	--	--	--
Impact 5.5-4: The proposed Program could create objectionable odors affecting a substantial number of people.	○	○	○	○	--	--	○	○	○	--	--	--	--	--	--	--	--

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable;

● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.
[2]Impacts associated with the specific facilities of the desalination plant.

Air pollutant emission sources are generally classified into two categories: stationary sources and mobile sources. Stationary sources can further be divided into area sources and point sources. Area sources are widely distributed and produce many small emissions (e.g., residential water heaters, painting operations, lawn mowers, and consumer products such as barbeque lighter fluid and hair spray). Point sources consist of one or more emission sources at a facility with an identified location (e.g., refinery boilers or combustion equipment that produces electricity or heat). Area sources associated with the proposed Program would be limited to natural gas used for space and water heating and landscaping activities associated with maintenance of the property.

Mobile sources refer to emissions from motor vehicles and are classified as either on-road or off-road. On-road sources include automobile emissions, truck emissions, and indirect sources. On-road sources associated with the operation of the Program would generally be limited to employee's vehicles accessing the site and delivery trucks servicing the facility. On-road sources associated with the construction of the Program components would include workers commuting to and from the project site and hauling trucks used to deliver construction materials. Off-road sources include watercraft, aircraft, trains, and self-propelled construction equipment. The only off-road sources associated the Program are heavy construction equipment.

For the purposes of this Draft EIR evaluation, emissions for construction and operational activities of the proposed Program were estimated using the air quality modeling software package, URBEMIS[2] 2002, as suggested by the MBUAPCD. The construction scenario was assumed using conservative values to provide a worst-case analysis

Impacts and Mitigation

<u>Construction</u>

The principal sources of pollutant emissions during construction are fugitive dust and construction-equipment engine exhaust. Fugitive dust would be created during clearing, grubbing, excavation, and grading; demolition of structures and pavement; vehicle travel on paved and unpaved roads; and material blown from unprotected graded areas, stockpiles, and haul trucks. Fugitive dust includes PM_{10} and $PM_{2.5}$, which are potential health hazards and often contribute to visibility and nuisance impacts that occur when dust from construction activities is deposited on homes, vehicles, and plants. Generally, the distance that particles drift from their source depends on their size, emission height, and wind speed. About 50 percent of fugitive dust is made up of particles greater than 100 microns in diameter. These particles are responsible for the reduced visibility often associated with construction, as well as the nuisance caused by the deposition of dust on vehicles and in exterior areas used by people for recreation and business. Given their relatively large size, these particles tend to settle within 6 to 9 meters (20 to 30 feet) of their source. Particles less than 100 microns in diameter can travel nearly 100 meters (several hundred feet) before settling to the ground, depending on wind speed. These smaller particles also contribute to visibility and nuisance impacts, and include PM_{10} and $PM_{2.5}$.

Another source of pollutants during construction is the engine exhaust from construction equipment; the principal pollutants of concern are NO_X and ROG. NO_X and ROG emissions from construction equipment contribute to the formation of O_3, which is a regional pollutant of concern.

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[2] URBEMIS is the URBan EMISsions Model.

The difference in alternatives, from an air quality standpoint, is related to total proposed Program emissions. Alternative D-1 would install three conveyance lines (raw water intake, concentrate discharge, and distribution lines), each approximately 15,000 linear feet, and Alternative D-2 which would install an additional 20,000 linear feet of distribution lines in Santa Cruz County and city of Capitola.

Desalination Plant (Alternatives D-1 and D-2)

The proposed desalination plant, regardless of the selected area, would require approximately three acres of land for development. For purposes of construction analysis, the desalination facility has been modeled as a large industrial land use. It has been assumed that for site preparation, two bulldozers and two loaders/backhoes, or equivalent equipment, would be required to work eight hours per day for two months. Construction of the actual facility would require an additional 16 months, with an average of five pieces of heavy equipment, such as industrial saws, heavy forklifts, and generators/compressors, operating an average of eight hours per day. During the final month of construction of the desalination plant, parking lots and access roads would also be constructed. It has been assumed that parking and roadway construction would require a paver, a roller, and a grader, or equivalent equipment, working eight hours per day. Based on these assumptions, the emission estimates were prepared for the construction of the proposed desalination plant and are presented in Table 5.5-5.

As shown in Table 5.5-5, daily emissions of all pollutants would be higher during the building construction activities than during the site preparation phase, except for SO_X and PM_{10}. Site preparation activities and building construction activities would not occur simultaneously, and the associated emissions would not be combined in calculating total maximum daily emissions. Thus, the maximum daily emissions during the construction of the desalination plant would be equal to the total daily emissions for the site preparation phase for all pollutants except for PM_{10}, for which the facilities construction phase would produce higher total emissions.

Conveyance and Pumping Facilities (Alternatives D-1 and D-2)

The proposed conveyance facilities for the raw water, treated water, concentrate water, and distribution water would each require approximately 15,000 linear feet of pipelines under both alternatives, with 20,000 additional linear feet needed under Alternative D-2. All conveyance facilities would be located within the public right-of-way in various roadways. Installation and renovation of the pipelines would be conducted using the cut and cover technique, which would involve sawcutting the pavement, excavating a trench, removing soils, installing the pipeline, backfilling of the trench, and repaving. To provide a conservative analysis, this evaluation assumes that a typical trench would be 8 feet wide and 7 feet deep, and that two construction crews would excavate approximately 600 linear feet per day, which would represent 33,600 cubic feet of soil per day. Excavation activities would require the use of industrial/concrete saws, excavators, a backhoe, loaders, generators, and compressors. Repaving activities would require similar equipment as that used in the paving of the parking lot and roadways as part of the desalination plant (i.e., a paver, a

Table 5.5-5
Estimated Daily Construction Emissions – Desalination Plant (lbs/day)

	VOC	NO_X	CO	SO_X	PM_{10}
Site Preparation					
Construction equipment	8.61	72.10	59.00	0.00	3.36
Construction workers' trips	0.10	0.17	1.89	0.00	0.00
Dump/Haul trucks	0.08	1.36	0.29	0.02	0.04
Disturbance	0.00	0.00	0.00	0.00	30.56
Total Maximum Daily Emissions – Site Preparation	**8.79**	**73.63**	**61.18**	**0.02**	**33.96**
Facility Construction					
Construction equipment	8.09	63.25	58.72	0.00	2.88
Construction workers' trips	0.33	0.15	3.60	0.01	0.0
Architectural Coatings	9.16	0.00	0.00	0.00	0.00
Paving	4.14	24.97	34.34	0.00	1.02
Total Maximum Daily Emissions – Facilities Construction	**21.72**	**88.37**	**96.66**	**0.01**	**3.90**
Total Maximum Daily Emissions	**21.72**	**88.37**	**96.66**	**0.01**	**33.96**

Source: EDAW 2004

roller, and a grader). While the overall length of time for constructing the conveyance systems would be slightly longer under Alternative D-2, the maximum potential daily emissions would be the same for either Alternative D-1 or Alternative D-2. Table 5.5-6 presents the estimated emissions associated with the installation and modification of the water conveyance facilities.

As shown in Table 5.5-7, maximum daily emissions during the roadway demolition phase would be higher than during the excavation and paving phases for all pollutants except PM_{10}. Demolition activities, excavation, and paving activities would not occur simultaneously, and the emissions associated with each phase are therefore not combined in calculating total maximum daily emissions. The demolition would occur first; the roadway surface would be cut and removed prior to excavating the trench and installing the new pipelines, which would be followed by backfilling and compression of soil in the trench. Only after the trench has been backfilled and compacted would paving activities occur.

While it is assumed that site preparation for the proposed desalination plant site would occur separately from other construction-related activities of the proposed Program, construction of the desalination plant, pumps, and conveyance facilities is expected to be conducted concurrently. Therefore, construction emissions are evaluated based on the maximum potential daily emissions from each phase, which are presented in Table 5.5-7.

Table 5.5-6
Estimated Daily Construction Emissions – Conveyance Facilities (lbs/day)

	VOC	NO_X	CO	SO_X	PM_{10}
Demolition					
Construction equipment	7.69	61.54	54.77	0.00	2.85
Construction workers' trips	0.16	0.29	3.23	0.00	0.02
Dump/Haul trucks	0.11	1.88	0.40	0.03	0.06
Fugitive Dust	0.00	0.00	0.00	0.00	0.50
Total Maximum Daily Emissions − Demolition	**7.96**	**63.71**	**58.40**	**0.03**	**3.43**
Excavation					
Construction equipment	7.05	48.89	55.27	0.00	1.95
Construction workers' trips	0.04	0.02	0.39	0.00	0.01
Fugitive Dust	0.00	0.00	0.00	0.00	73.40
Total Maximum Daily Emissions − Excavation	**7.09**	**48.91**	**55.66**	**0.00**	**75.36**
Paving					
Construction equipment	4.06	25.63	34.21	0.02	0.98
Construction workers' trips	0.03	0.01	0.31	0.00	0.00
Asphalt Off-gassing	0.25	0.00	0.00	0.00	0.00
Total Maximum Daily Emissions − Paving	**4.34**	**25.64**	**34.52**	**0.02**	**0.98**
Total Maximum Daily Emissions	**7.96**	**63.71**	**58.40**	**0.03**	**75.36**

Source: EDAW 2004

Table 5.5-7
Maximum Daily Project Construction Emissions (lbs/day)

	VOC	NO_X	CO	SO_X	PM_{10}
Desalination Plant	21.72	88.37	96.66	0.01	33.96
Conveyance and Pumping Facilities	7.96	63.71	58.40	0.03	75.36
Total Maximum Daily Emissions	29.68	152.08	155.06	0.04	109.32
MBUAPCD Thresholds of Significance	No Quantifiable Thresholds				82
Does the Project Exceed MBUAPCD Thresholds of Significance?	N/A				Yes

Source: URBEMIS 2003

Since PM_{10} emissions would exceed the MBUAPCD threshold of significance, mitigation measures designed to reduce potential PM_{10} emissions have been identified to ensure that the proposed Program would not exceed the applicable thresholds. Estimates of other pollutants are provided for informational purposes only. While the Program would produce substantial amounts of NO_X

emissions, these emissions are not considered significant, as they are already accounted for in the MBUAPCD's AQMP.

Operational Emissions

Operations emissions of the proposed Program would result from area sources, including natural gas used for space heating and water heating, gasoline-powered landscaping and maintenance equipment, and mobile sources (i.e., vehicle operations associated with the proposed Program). Operations emissions were estimated using the emissions modeling program URBEMIS 2002. For motor vehicle trip emissions, URBEMIS 2002 uses EMFAC[3] 2002, which is a recent motor vehicle emission factor model of the California ARB.

Long-term on-site operational air emissions associated with the proposed Program would include natural gas use for space heating, landscaping equipment used in maintenance, and vehicular emissions associated with workers commuting to and from work and deliveries to the desalination plant. Estimated vehicle emissions are based on the trip generation rate of 6.80 trips per acre for industrial uses, which results in an average daily trip generation of 21 trips (6.8 trips/acre x 3 acres), of which approximately 90 percent would consist of employees commuting to work. Off-site emissions would be produced as a result of electrical consumption.

⌦ **Impact 5.5-1: The proposed Program could conflict with or obstruct implementation of the applicable air quality plan. Less than Significant.**

According to the MBUAPCD, a project would conflict or obstruct an air quality plan if it would be inconsistent with the projections contained in the adopted AQMP and if it would emit more than 137 lbs/day of NO_X or VOC during operation.

<u>Alternative D-1 (Applicable to the First Increment of this Alternative Only)</u>

The purpose of the proposed Program, under Alternative D-1, is to allow the City of Santa Cruz to supply an adequate amount of water to its residents during periods of drought. The projected water needs is based on the projections prepared for the IWP, which would be consistent with the *City of Santa Cruz General Plan and Local Coastal Program* growth projections through 2005, and the 1997 Association of Monterey Bay Area Governments (AMBAG) population projections (see Chapter 6, Growth Inducement and Secondary Effects of Growth). The MBUAPCD uses the same population projections in the preparation of its AQMP. As the first measure of consistency with the AQMP is determined through an assessment of the Program's impact on population growth, and the proposed Program is intended to meet the need of the City's population (as estimated by AMBAG for 2005), the project would not result in an exceedance of the projections used in the AQMP.

The second measure of consistency is based on the project's potential to exceed the MBUAPCD's operation emissions thresholds. Estimated operational emissions for the first increment of Alternative

[3] EMFAC is the EMissions FACtor model.

D-1 are based on the assumptions presented in the previous discussion; these estimated emissions are provided in Table 5.5-8.

Table 5.5-8
Estimated Daily Operational Emissions – Alternative D-1 (First Increment)

	VOC	NO_X	CO	SO_X	PM_{10}
Area Sources	0.12	0.81	0.80	0.00	0.00
Mobile Sources	0.27	0.35	3.16	0.00	0.30
Off-site Electrical Generation	0.30	34.50	6.00	3.60	1.20
Total Maximum Daily Operational Emissions	0.69	35.66	9.96	3.60	1.50
MBUAPCD Thresholds of Significance	137	137	550	150	82
Does the Program Exceed Thresholds?	No	No	No	No	No

Sources: URBEMI,S 2002; SCAQMD, CEQA Air Quality Analysis Handbook 1993

Notes: Off-site electrical emission estimates were developed using the South Coast Air Quality Management District's (SCAQMD), CEQA Air Quality Analysis Handbook 1993.

As shown in Table 5.5-8, the first increment of Alternative D-1 (i.e., production of 2.5 mgd over six months) is estimated to produce 0.69 lbs/day of VOC and 35.66 lbs/day of NO_X. This would result in approximately 126 lbs/year (0.01 tons/year) of VOC and 6,508 lbs/year (3.25 tons/year) of NO_X in a six-year period. Thus, the proposed Program under Alternative D-1 would not exceed thresholds of significance as defined by the MBUAPCD.

Since the proposed Program under Alternative D-1 would not exceed applicable operational thresholds and would be consistent with the MBUAPCD's AQMP, the proposed Program's impacts associated with the implementation of the MBUAPCD's AQMP would be less than significant.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

The purpose of the proposed Program, under Alternative D-2, is to allow the City of Santa Cruz to provide an adequate supply of water to its residents and to supplement the supply of the SqCWD during nondrought periods. The projected water needs would be consistent with the County's and the local jurisdictions' General Plans and the 1997 AMBAG population projections. The MBUAPCD also uses the AMBAG population projections in the preparation of the MBUAPCD AQMP. Alternative D-2 would supplement the SqCWD during nondrought years in addition to providing the City with drought supply. The supplemental water would be used to sustain adequate supplies and provide for projected growth, which is based on the population projections in the local General Plans developed from the same growth projections used by the MBUAPCD. Since the growth projections would be consistent with the MBUAPCD's AQMP, the proposed Program would have less than significant impacts associated with obstructing the implementation of the MBUAPCD's AQMP.

The primary difference between Alternative D-1 and Alternative D-2 is the quantity of potable water produced. Under Alternative D-2, the proposed Program could operate more frequently and could produce the same quantity of water annually as Alternative D-1, except for an expected six-month period out of six years when the plant would produce twice the quantity of water typically produced (i.e., 2.5 mgd). The estimated daily emissions under Alternative D-2, the first increment, are presented in Table 5.5-9.

Table 5.5-9
Estimated Daily Operational Emissions – Alternative D-2 (First Increment)

	VOC	NO_X	CO	SO_X	PM_{10}
SqCWD Supplemental Water Only (1.25 mgd)					
Area Sources	0.12	0.81	0.80	0.00	0.00
Mobile Sources	0.27	0.35	3.16	0.00	0.30
Off-site Electrical Generation (1.25 mgd – 5.5 Years)	0.15	17.25	3.00	1.80	0.60
Total Maximum Daily Operational Emissions	0.54	18.41	6.96	1.80	0.90
MBUAPCD Thresholds of Significance	137	137	550	150	82
Does the Program Exceed Thresholds?	No	No	No	No	No
City / SqCWD (2.5 mgd)					
Area Sources	0.12	0.81	0.80	0.00	0.00
Mobile Sources	0.27	0.35	3.16	0.00	0.30
Off-site Electrical Generation	0.30	34.50	6.00	3.60	1.20
Total Maximum Daily Operational Emissions	0.69	35.66	9.96	3.60	1.50
MBUAPCD Thresholds of Significance	137	137	550	150	82
Does the Program Exceed Thresholds?	No	No	No	No	No

Sources: URBEMIS 2002; SCAQMD CEQA Air Quality Analysis Handbook 1993

Notes: Off-site electrical emission estimates were developed using the South Coast Air Quality Management District's (SCAQMD), CEQA Air Quality Analysis Handbook 1993.

As shown Table 5.5-9, typical operation of Alternative D-2 would generate 0.54 lbs/day of VOC and 18.41 lbs/day of NO_X. During the six-month period when the proposed Program would produce additional water for the City, Alternative D-2 would generate 0.69 lbs/day of VOC and 35.66 lbs/day of NO_X. This would result in approximately 197 lbs/year of VOC and 6,720 lbs/year of NO_X during each of the five nondrought years and 225 lbs/year of VOC and 9,868 lbs/year of NO_X during the projected one in six drought year (six months at 2.5 mgd and six months at 1.25 mgd). As shown in Table 5.5-9, the estimated daily emissions during the drought and nondrought years would not exceed the MBUAPCD's thresholds of significance.

Since the proposed Program under Alternative D-2 would not exceed applicable operational thresholds and would be consistent with the MBUAPCD's AQMP, the proposed Program would have less than significant impacts associated with obstructing the implementation of the MBUAPCD's AQMP.

Alternative D-1 (Applicable to the Subsequent Increment of this Alternative Only)

As with the first increment of Alternative D-1, subsequent increments of Alternative D-1 would not operate continuously. However, subsequent increments would operate for a longer period (up to eight months out of a six-year period, as opposed to six months). Under the subsequent increments of Alternative D-1, operation of the proposed Program would generate approximately 0.81 lbs/day (197 lbs/year) of VOC and 49.46 lbs/day (12,034 lbs/year) of NO_X to produce 3.5 mgd, and approximately 0.93 lbs/day (approximately 226 lbs/year) of VOC and 63.26 lbs/day (15,391 lbs/year) of NO_X to produce 4.5 mgd. These emissions would not exceed the operation thresholds defined by the MBUAPCD (see Table 5.5-3). Therefore, the subsequent operational increments of Alternative D-1 would not result in significant impacts on regional or local air quality and would not conflict with or obstruct implementation of the MBUAPCD AQMP.

The subsequent increments of Alternative D-1 also provide a contingency that the City may utilize 1.25 mgd year-round. Under this scenario, the daily emissions would be the same as for Alternative D-2, described below.

Alternative D-2 (Applicable to the Subsequent Increment of this Alternative Only)

As with the first increment of Alternative D-2, subsequent increments of Alternative D-2 would operate continuously at 1.25 mgd, with short-term increases in production to levels similar as those discussed for subsequent increments of D-1. Under the subsequent increments of Alternative D-2, normal operation would last 5.25 years (63 months), while the short-term increases under the subsequent increments of Alternative D-2 would be for eight months out of the six-year period. The subsequent increments of Alternative D-2 would generate the same emissions as the first increment of Alternative D-2 under non-drought conditions. During drought conditions (i.e., one year out of six years, it is estimated that operation of the proposed Program would generate approximately 0.81 lbs/day (197 lbs/year) of VOC and 49.46 lbs/day (12,033 lbs/year) of NO_X when producing 3.5 mgd for 8 months. The remaining four months would operate at 1.25 mgd, and would generate approximately 66 lbs of VOC and approximately 2,240 lbs of NO_X. Therefore, the total pollutant generation during a drought year would be approximately 263 lbs/year of VOC and approximately 14,274 lbs/year of NO_X.

Operation of the proposed Program would generate approximately 0.93 lbs/day (226 lbs/year) of VOC and 63.26 lbs/day (6,391 lbs/year) of NO_X to produce 4.5 mgd for eight months. The remaining four months would operate at 1.25 mgd. The total pollutant generation during a drought year would be approximately 292 lbs/year of VOC and 18,631 lbs/year of NO_X.

These emissions would not exceed the operation thresholds defined by the MBUAPCD (see Table 5.5-3). Therefore, the subsequent operational increments of Alternative D-2 would not result in significant impacts on regional or local air quality and would not conflict with or obstruct implementation of the MBUAPCD AQMP.

The subsequent increments of Alternative D-2 also provide a contingency that the City may utilize 1.25 mgd year-round in addition to the 1.25 mgd used by SqCWD. Under this scenario, the daily emissions would be double those shown for SqCWD in Table 5.5-10. If at some point in the future, the City follows through with this option, additional analysis would be undertaken to ensure that the proposed Program would not exceed the thresholds of significance as defined by the MBUAPCD.

Mitigation Measures

None required.

⌦ **Impact 5.5-2: Implementation of the proposed Program could violate an air quality standard or contribute substantially to an existing or projected air quality violation. Less than Significant with EIR-Identified Mitigation.**

According to the MBUAPCD, adverse construction-related impacts would occur if construction of a project would generate 82 pounds or more of PM_{10} per day.

Alternative D-1 (Applicable to all Increments of this Alternative Only)

Individually, construction of the desalination plant or construction of the conveyance and pumping facilities would not generate PM_{10} in quantities greater than the threshold. However, as shown in Table 5.5-8, the construction of the proposed Program components, when conducted concurrently, could exceed the MBUAPCD construction thresholds of significance if no mitigation is implemented.

Table 5.5-3 identifies the thresholds of significance used to determine if operation of a proposed project would violate an air quality standard or contribute substantially to a projected air quality violation. As discussed in Impact 5.5-1, Alternative D-1 is not expected to exceed operational emission thresholds. Operational-related traffic volumes are expected to be low, averaging approximately 21 vehicle trips per day, and would not cause substantial degradation of traffic operations on local roadways or at local intersections. It is assumed that all access roadways would be paved, and thus would not generate substantial amounts of PM_{10}. Thus, Alternative D-1 would not violate or contribute to a projected violation of state or federal air quality standards.

Since construction of the proposed plant and conveyance facilities could exceed the applicable PM_{10} threshold, mitigation would be required during construction to reduce the potential impact to less-than -significant. Implementation of Mitigation Measure would reduce estimated PM_{10} generation from approximately 109 pounds per day to approximately 42 pounds per day.

Alternative D-2 (Applicable to the all Increments of this Alternative Only)

Individually, construction of the desalination plant or construction of the conveyance and pumping facilities would not generate PM_{10} in quantities greater than the threshold. However, as shown in

Table 5.5-8, the construction of the proposed Program components, when conducted concurrently, could exceed the MBUAPCD construction thresholds of significance if no mitigation is implemented.

Table 5.5-3 identifies the thresholds of significance used to determine if operation of a proposed project would violate an air quality standard or contribute substantially to a projected air quality violation. As discussed in Impact 5.5-1 Alternative D-2 is not expected to exceed operational emission thresholds. Operational-related traffic volumes are expected to be low, averaging approximately 21 vehicle trips per day, and would not cause substantial degradation of traffic operations on local roadways or at local intersections. It is assumed that all access roadways would be paved, and thus would not generate substantial amounts of PM_{10}. Thus, implementation of Alternative D-2 would not violate or contribute to a projected violation of state or federal air quality standards.

Since construction of Alternative D-2 could exceed the applicable PM_{10} threshold, mitigation would be required during construction of the proposed Program to reduce the potential impact to less than significant. Implementation of Mitigation Measure 5.5-2 would reduce estimated PM_{10} generation from approximately 109 pounds per day to approximately 42 pounds per day.

Mitigation Measures

Mitigation Measure 5.5-2: The City shall implement the following dust-abatement measures at construction sites:

- Water all active construction areas at least twice daily.
- Prohibit all grading activities during periods of high wind (over 15 miles per hour).
- Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days).
- Cover all trucks hauling dirt, sand, or loose materials. Haul trucks shall maintain at least 2 feet of freeboard.
- Sweep streets if visible soil material is carried out from the construction site.
- Replace ground cover in disturbed areas as soon as possible.
- Cover inactive storage piles.

Significance After Mitigation: Less than Significant.

☒ **Impact 5.5-3: Proposed Program could expose sensitive receptors to substantial pollutant concentrations. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to all Increments of both Alternatives)

The proposed Program would result in significant impacts if it would result in a violation of any CO, PM_{10}, or toxic air contaminant standards at a sensitive receptor. As discussed in Impact 5.5-2, due to low projected traffic volumes associated with the proposed Program, Alternatives D-1 and D-2 are not expected to result in substantial degradation of traffic conditions on local roadways or at local intersections. Furthermore, it has been assumed that all access roadways would be paved, and thus Program-related traffic would not generate substantial amount of PM_{10} from unpaved roadways. The proposed Program would store and use hazardous chemicals to process the desalinated water; due to the lack of defined plans, it is not possible at this time to determine if the Program would expose sensitive receptors to substantial concentrations of toxic air pollutants. Therefore, upon completion of final design plans and final site selection, the MBUAPCD will be contacted and all required permits will be obtained prior to construction and operation of the proposed Program.

Mitigation Measures

Mitigation Measure 5.5-3: Prior to construction of Program facilities, the City shall contact the MBUAPCD to identify and obtain any permits required for construction and operation of the proposed Program.

Significance After Mitigation: Less than Significant.

☒ **Impact 5.5-4: The proposed Program could create objectionable odors affecting a substantial number of people. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to all Increments of both Alternatives)

Water treatment, either through physical processes such as gravitational settling or filtration or through chemical treatment to disinfect the water, has some potential to generate odors. Odors may derive from organic material suspended in the water due to outgassing of dissolved gases used for disinfection, or from sludge that has been removed from the water during treatment. While odor may be a significant concern at wastewater treatment plants, it is generally not a concern at water treatment plants.

Odor in water treatment is generally related to the amount of dissolved oxygen and to the dissolved organic material that generates an oxidation demand. Oxygen-rich (aerobic) environments normally have little associated odor, but oxygen-deficient (anaerobic) environments create conditions in which odorous gases are released from biological processes. Raw seawater, like freshwater, is well aerated through constant motion; however, raw seawater typically contains more organic material than freshwater. Much of the organic materials in the raw seawater are removed by filtration as well as by the addition of polymers. Predosing with chlorine kills biological organisms. After filtration the water receives additional chlorination, if necessary, and the treated water enters a closed system where it is sealed off from the atmosphere. Final treated water may have a very faint chlorine smell, which is not noticeable in the plant vicinity.

Minor odors can be noticed when a filterbed is drained and algae or other accumulations are flushed off the filterbed walls just before back-flushing is initiated. An earthy, humus-like odor seems to be generated when the filter medium is not fully covered by water. The odor, however, requires only nominal dilution with fresh air to reduce its strength below the level of human detection. Thus, Alternative D-1 would not expose a substantial number of people to objectionable odors.

Mitigation Measures

None required.

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5.6 NOISE

5.6.1 Introduction

This section documents existing noise conditions in Santa Cruz County and the cities of Santa Cruz and Capitola, discusses the regulatory context for noise, and estimates future noise impacts to adjacent sensitive receptors due to construction, proposed Program operation, and anticipated vehicular traffic increases along affected local roadways.

Definition of Sound and Noise

Sound is a vibratory disturbance created by a moving or vibrating source which can be detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance and, in the extreme, hearing impairment (Caltrans 1998).

Decibels and Frequency

In its most basic form, a continuous sound can be described by its frequency or wavelength (pitch) and its amplitude (loudness). Frequency is expressed in cycles per second, or hertz (Hz). Frequencies are heard as the pitch or tone of sound. High-pitched sounds have high frequencies; low-pitched sounds have low frequencies. Sound pressure levels (SPL) are described in units called the decibel (dB).

Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. A doubling of the energy of a noise source, such as traffic volume, increases the noise level by 3 dB; a halving of the energy results in a 3-dB decrease.

Perception at the Receiver and A-Weighting

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale was devised to approximate the frequency response of the ear when listening to most ordinary sounds. When people judge the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Therefore, the “A-weighted” noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are written dB(A) or dBA. Table 5.6-1 shows the relationship of various noise levels to commonly experienced noises.

Human perception of noise has no simple correlation with acoustical energy. The perception of noise is not linear in terms of dBA or in terms of acoustical energy. Two noise sources do not sound twice as loud as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA, increase or decrease; that a change of 5 dBA is readily perceptible; and that an increase (or decrease) of 10 dBA sounds twice (or half) as loud (Caltrans 1998).

Table 5.6-1
Typical Noise Levels

COMMON OUTDOOR ACTIVITIES	NOISE LEVEL (DBA)	COMMON INDOOR ACTIVITIES
	110	Rock band
Jet fly-over at 300 meters (1,000 feet)	100	
Gas lawn mower at 1 meter (3 feet)	90	
Diesel truck at 15 meters (50 feet), at 80 kilometers per hour (50 miles per hour)	80	Food blender at 1 meter (3 feet); garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime gas lawn mower, at 30 meters (100 feet)	70	Vacuum cleaner at 3 meters (10 feet)
Commercial area heavy traffic, at 90 meters (300 feet)	60	Normal speech at 1 meter (3 feet)
Quiet urban daytime	50	Large business office dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime	30	Library
Quiet rural nighttime	20	Bedroom at night, concert hall (background)
	10	Broadcast/recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol, October 1998

Noise Propagation

Noise changes both in level and frequency spectrum as it travels from the source to the receiver. The most obvious change is the decrease in noise levels as the distance from the source increases. The manner in which noise levels decrease with distance depends on the following important factors:

- *Geometric spreading from point and line sources:* Sound from a small, localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level drops off at a rate of 6 dBA for each doubling of the distance. The movement of a vehicle makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. For a line source, the sound level drops off at a rate of 3 dBA per doubling of distance.
- *Ground absorption*: Hard sites (i.e., sites with a reflective surface between the source and the receiver, such as parking lots or smooth bodies of water) receive no excess ground attenuation, and the change in noise level with distance (drop-off rate) is simply the geometric spreading of the source. Soft sites (i.e., sites that have an absorptive ground

surface, such as soft dirt, grass, or scattered bushes and trees) receive an excess ground attenuation value of 1.5 dBA per doubling of distance.

- *Atmospheric effects*: Wind speed will bend the path of sound to "focus" it on the downwind side and make a "shadow" on the upwind side of the source. At short distances up to 50 meters, the wind has a minor influence on the measured sound level. For longer distances, the wind effect becomes appreciably greater. Temperature gradients create effects similar to those of wind gradients, except that they are uniform in all directions from the source. On a sunny day with no wind, temperature decreases with altitude, giving a "shadow" effect for sound. On a clear night, temperature may increase with altitude, "focusing" sound on the ground surface.
- *Shielding by natural and man-made features, noise barriers, diffraction, and reflection*: A large object in the path between a noise source and a receiver can significantly attenuate noise levels at that receiver location. The amount of noise reduction provided by this "shielding" depends on the characteristics of the object and the frequencies of the noise levels. Natural terrain features such as hills and dense woods, as well as man-made features such as buildings and walls, can significantly alter noise levels.

Noise Descriptors

Several rating scales (or noise "metrics") exist to analyze adverse effects of noise on a community. These scales include the equivalent noise level (L_{eq}), the community noise equivalent level (CNEL), and the day-night average sound level (DNL or L_{dn}). Average noise levels over a period of minutes or hours are usually expressed as dBA L_{eq}, meaning the equivalent noise level for that period of time. The period of time averaging may be specified: $L_{eq(3)}$ would be a three-hour average. When no period is specified (i.e., L_{eq}), a one-hour average is assumed. It is important to understand that noise of short duration (i.e. times substantially less than the averaging period) are averaged into ambient noise during the period of interest. Thus, a loud noise lasting many seconds or a few minutes may have minimal effect on the measured sound level averaged over a one-hour period.

Unlike the L_{eq} metric, the CNEL noise metric is based on 24 hours of measurement. CNEL also differs from L_{eq} in that it applies a time-weighted factor designed to emphasize noise events that occur during the evening and nighttime hours (when quiet time and sleep disturbance is of particular concern). Noise occurring during the daytime period (7:00 a.m. to 7:00 p.m.) receives no penalty (i.e., there is no increase in the adjusted decibel level to account for noise-sensitive hours). Noise produced during the evening period (7:00 p.m. to 10:00 p.m.) is penalized by 5 dBA, while nighttime (10:00 p.m. to 7:00 a.m.) noise is penalized by 10 dBA.

The L_{dn} noise metric is similar to the CNEL metric except that the evening period (7:00 p.m. to 10:00 p.m.) receives no penalty. Both the CNEL and L_{dn} metrics yield approximately the same 24-hour value (within 1 dBA), with the CNEL being the more restrictive of the two.

5.6.2 Existing Conditions

City of Santa Cruz

The following description is based in part on the *City of Santa Cruz General Plan and Local Coastal Program,* the *Long Marine Lab Master Plan EIR* (LML EIR), and the UCSC CLRDP. Based on a review of these documents, the dominant noise source in the study area is traffic on local roadways, with intermittent train operations on the SPRR, which passes through the northern portion of the Industrial Park Area. Other minor sources of noise include agricultural operations in the western portion of the study area, waves and wind from the ocean, and noise typical of residentially developed areas (e.g., children playing, lawn mowers, dogs barking, etc.). The majority of arterials within Santa Cruz generate noise levels of 65 dBA L_{dn} at 50 feet from the edge of the roadway. Peak-hour traffic noise levels near the desalination areas range from 50 L_{eq} on Delaware Avenue west of Shaffer Road to 68 L_{eq} on Highway 1 east of Shaffer Road. Ambient nighttime noise levels range from 20–30 dBA L_{dn} quieter. Noise levels along Highway 1 in Santa Cruz are quieter than those in Capitola and the county portion of the study area, as the traffic of Highway 1 within city boundaries is more reflective of an arterial roadway than a highway. Typical traffic noise levels near the Industrial Park Area average 62 dBA L_{eq}, while traffic noise levels near the Shaffer Road/Antonelli's Pond Area and Terrace Point Area average 55 dBA L_{eq}. Existing noise levels in the area of the existing junction structure are assumed to be similar to those in the adjacent residential uses.

Santa Cruz County

Ambient noise levels in Santa Cruz County vary widely depending upon proximity to noise generators, such as major roads, airports, and rail lines. Noise levels in the unincorporated county portion of the study area are predominately influenced by traffic on local roadways and in particular along Highway 1. Other sources of noise include trains operating on the SPRR, agricultural operations in the western portion of the study area, waves and wind from the ocean, and noise typical of residentially developed areas (e.g., children playing, lawn mowers, dogs barking, etc.). A review of traffic noise contour maps of surrounding jurisdictions indicate that noise levels adjacent to local arterial roadways would reach 65 dBA L_{dn} 50 feet from the roadway edge. Noise levels along Highway 1 would reach 70 dBA L_{dn} as far as 400 feet from the roadway edge (City of Santa Cruz 1992; City of Capitola 1989).

Aircraft noise in the county consists of flyovers of airplanes to and from Watsonville Municipal Airport, occasional California Department of Forestry (CDF) aircraft, as well as sporadic commercial over-flights.

Freight rail service is operated within Santa Cruz County on a branch line of the SPRR that traverses the county between the cities of Davenport and Watsonville. This railway line is used for limited materials movement and serves the RMC Lone Star cement plant in Davenport, as well as providing limited rail access to industries in the cities of Live Oak, Santa Cruz, and Watsonville.

The Santa Cruz, Big Trees, and Pacific Railway Company owns and operates a rail line between the cities of Santa Cruz and Felton, offering minor freight and recreational passenger service. Several daily passenger trains are operated on this line during the summer. This line serves the lumber mill in the city of Felton for freight service. Amtrak offers one northbound and one southbound daily intercity train, the Coast Starlight, on this route.

Marine transportation facilities within the county are devoted predominately to recreational activities and commercial fishing activities. There are no cargo shipment harbors or terminals for commercial passenger ports in the county. The closest port facility is at Moss Landing in Monterey County.

City of Capitola

According to the *City of Capitola General Plan*, the most substantial noise problems in the city are traffic related. Occasional noise disturbances have been noted with respect to local nightlife; however, this appears to be limited in nature. In many parts of the city, the loudest continuous sounds come from the ocean. Noise-sensitive locations identified in the General Plan include Capitola Elementary School and New Brighton Middle School, both of which are near the intersection of Monterey Avenue and Washburn Avenue. The greatest noise levels in Capitola are associated with Highway 1, where levels are expected to reach 65 dBA L_{dn} within approximately 800 feet of the highway by the year 2005. Noise contour maps included in the Capitola General Plan indicate that noise levels adjacent to local arterial roadways reach 65 dBA L_{dn} at 50 feet from the roadway edge.

5.6.3 Regulatory Framework

City of Santa Cruz

The City of Santa Cruz adopted a Noise Element as part of its *General Plan and Local Coastal Program* (City of Santa Cruz 1992). The Noise Element identifies a goal and related policies for noise control and land use compatibility in the city. The Noise Element contains noise-sensitive land use compatibility guidelines for community noise environments, as indicated in Table 5.6-2. These guidelines are used to evaluate the compatibility of different land uses in terms of noise level exposure.

The City of Santa Cruz also adopted a noise ordinance, Chapter 9.36, as part of the Santa Cruz Municipal Code. The noise ordinance prohibits offensive noise—defined as loud, boisterous, irritating, penetrating, or unusual—between the hours of 10:00 p.m. and 8:00 a.m. within 100 feet of any building regularly used for sleeping or which disturbs any person of ordinary sensitivities. The noise ordinance includes exceptions for emergencies and public works. The exception for public works allows construction for an additional hour, between 7:00 a.m. and 8:00 a.m., for performance of public works that would disrupt traffic or where time constraints would hamper the contractor’s ability to complete the project in conformance with the contract. Additionally, on a case-by-case basis, the city manager may authorize work conducted outside these hours.

Table 5.6-2
Acceptable Noise Levels for Land Use Categories, City of Santa Cruz

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE L_{DN} OR CNEL DB						
	55	60	65	70	75	80	
Residential – Low-Density Single Family, Duplex, Mobile Homes							
Residential – Multiple Family							
Transient Lodging – Motels, Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Area, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, and Agriculture							

Normally Acceptable. Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable. New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Normally Unacceptable. New construction and development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable. New construction or development should generally not be undertaken.

Source: City of Santa Cruz General Plan 1994

Noise regulations for specific land developments are contained in the zoning ordinance, Chapter 24 of the Santa Cruz Municipal Code. Section 24.14.260 states that, for residential properties, no person shall create, or allow to be created, a noise level more than 5 dBA above local ambient levels, and that, for commercial and industrial properties, no person shall create, or allow to be created, a noise level more than 6 dBA above local ambient levels. The local ambient level is to be determined by a six-minute measurement using a sound-level meter set on slow response with “A” weighting, when the offensive noise is silenced.

Santa Cruz County

Santa Cruz County adopted a Public Safety and Noise Element as part of its *General Plan and Local Coastal Program* (Santa Cruz County 1994). The element identifies objectives and policies for noise control in the county as it relates to stationary and rail sources. It also defines or requires the following: land use noise compatibility standards (see Table 5.6-3); maximum exposure standards for noise from stationary sources (see Table 5.6-4); rail noise and vibration standards; acoustical analysis for new noise-sensitive land developments in areas above 60 dB L_{dn} or for other new land developments that may expose existing land uses to noise levels in excess of the compatibility standards; and mitigation of construction noise as part of all project approvals. Additionally, Section 6.9 of the element states “new noise-sensitive land developments that cannot meet [the standards in Table B] shall not be permitted.” In addition, Section 6.10 of the element discusses ground transportation noise and requires environmental review for any transportation project, road or rail, that would increase the existing L_{dn} levels, and mitigation for any project that would raise existing noise levels by 5 dB L_{dn} in areas that are currently below, and with the project would remain below, 60 dB L_{dn}, or projects that would increase noise levels by 3 dB L_{dn} in areas that are currently above, or due to the project would be above, 60 dB L_{dn}. Section 6.11 is primarily related to air transportation noise. As the proposed Program would not affect air transportation and does not include residential development, Section 6.11 would not apply.

The County adopted a noise ordinance, Chapter 8.30, as part of the County Code. The noise ordinance prohibits offensive noise—defined as loud, boisterous, irritating, penetrating, or unusual sound—between the hours of 10:00 p.m. and 8:00 a.m. within 100 feet of any building regularly used for sleeping or which disturbs any person of ordinary sensitivities. The noise ordinance includes exceptions for farming operations carried out on land designated by the County as a commercial agricultural area, or where another portion of the County Code has provided noise regulation for specific activities, such as amplified sound for special events and gatherings.

Table 5.6-3
Land Use Compatibility for Community Noise Environments, Santa Cruz County

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE L_{DN} OR CNEL DB 55	60	65	70	75	80	
Residential, Motels and Hotels							
Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds							
Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls and Churches							
Office Buildings, Business Commercial, and Professional							
Auditoriums, Concert Halls, Amphitheaters							
Industrial, Manufacturing, Utilities, and Agriculture							

Normally Acceptable
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

Unacceptable
New construction and development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

Source: Santa Cruz County General Plan 1994

Table 5.6-4
Maximum Allowable Noise Exposure Stationary Noise Source (1)

	DAYTIME (5) (7 A.M. TO 10 P.M.)	NIGHTTIME (2,5) (10 P.M. TO 7 A.M.)
Hourly L_{eq} – Average Hourly Noise Level (3)	50	45
Maximum Level, dB (3)	70	65
Maximum Level, dB – Impulse Noise (4)	65	60

dB = decibel

1 *As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.*

2 *Applies only where the receiving land use operates or is occupied during nighttime hours.*

3 *Sound-level measurements shall be made with "slow" meter response.*

4 *Sound-level measurements shall be made with "fast" meter response.*

5 *Allowable levels shall be raised to the ambient noise levels where the ambient levels exceed the allowable levels. Allowable levels shall be reduced if the ambient level is at least 10 dB lower than the allowable level.*

City of Capitola

<u>General Plan</u>

The City of Capitola has adopted a Noise Element as part of its General Plan (City of Capitola 1989). The Noise Element identifies goals and related policies for noise control in Capitola. The Noise Element contains noise-sensitive land use compatibility guidelines for community noise environments, as indicated in Table 5.6-5. These guidelines are used to evaluate the compatibility of different land uses in terms of noise level exposure.

Capitola adopted a noise ordinance, Chapter 9.21, as part of the Capitola Municipal Code. The noise ordinance prohibits offensive noise—defined as loud, boisterous, irritating, penetrating, or unusual sound—between the hours of 10:00 p.m. and 8:00 a.m. within 200 feet of any residence, hotel, apartment house, cabin, cottage, cottage court, lodging facility, or any place regularly used for sleeping purposes on any day or days. The noise ordinance includes exceptions for mechanical sweepers and leaf blowers on private property between 11:00 p.m. and 7:00 a.m.

5.6.4 Impacts and Mitigation Measures

This section presents an analysis of the impacts and mitigation measures for short-term (construction) and long-term (operation) noise impacts.

Significance Criteria

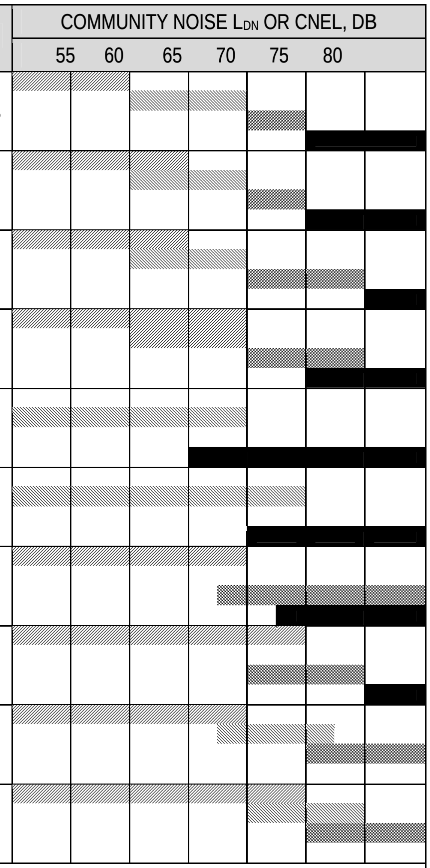
In accordance with Appendix G of the *CEQA Guidelines*, the proposed Program would have a significant noise-related impact if it would:

- Expose persons to or generate noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the study area vicinity above levels existing without the proposed Program;
- Result in a substantial temporary or periodic increase in ambient noise levels in the study area vicinity above levels existing without the proposed Program; or
- Expose people residing or working in the study area to excessive noise levels, due to public or private airport operations.

The nearest public or private airport is the Watsonville Municipal Airport, which is located approximately 15 miles east of Santa Cruz. The proposed Program would not affect operations at this airport, nor would the proposed Program be adversely affected by aircraft utilizing this airport. The proposed Program would not expose people residing or working in the study area to adverse impacts related to aircraft noise or airport operations; therefore, no further discussion of these topics is required.

Table 5.6-5
Land Use Compatibility Standards for Noise Environments City of Capitola

LAND USE CATEGORY
Residential – Low-Density Single Family, Duplex, Mobile Homes
Residential – Multiple Family
Transient Lodging – Motels, Hotels
Schools, Libraries, Churches, Hospitals, Nursing Homes
Auditorium, Concert Hall
Sports Area, Outdoor Spectator Sports
Playgrounds, Neighborhood Parks
Golf Courses, Riding Stables, Water Recreation, Cemeteries
Office Buildings, Business Commercial and Professional
Industrial, Manufacturing, Utilities, Agriculture



Normally Acceptable. Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable. New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Normally Unacceptable. New construction and development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable. New construction or development should generally not be undertaken.

Source: City of Capitola General Plan 1989

City of Santa Cruz

Construction Noise Impacts

Proposed Program impacts would be considered significant if construction activities occur outside the allowed hours of 8:00 a.m. to 10:00 p.m. within 100 feet of any building used for sleep.

Stationary Noise Impacts

According to the Santa Cruz General Plan and noise ordinance, impacts would be considered significant if stationary noise generated onsite by new Program developments cause noise levels of 60 dB (L_{dn}) or above, or increased background noise levels by 6 dBA or more at property lines of existing noise-sensitive development.

County of Santa Cruz

Construction Noise Impacts

Proposed Program impacts would be considered significant if construction activities occur outside the allowed hours of 8:00 a.m. to 10:00 p.m. within 100 feet of any building used for sleep.

Stationary Noise Impacts

According to the County General Plan and noise ordinance, impacts would be considered significant if stationary noise generated onsite by new Program developments would generate noise levels greater than 50 dBA L_{eq} during daytime hours or greater than 45 dBA L_{eq} during evening hours at the property line of adjacent noise-sensitive receptors.

City of Capitola

Construction Noise Impacts

Program impacts would be considered significant if construction activities occur outside the allowed hours of 8:00 a.m. to 10:00 p.m. within 200 feet of any building used for sleep.

Stationary Noise Impacts

According to the Capitola General Plan and noise ordinance, impacts would be considered significant if stationary noise generated onsite by new Program developments would generate noise levels of 60 dB (L_{dn}) or above.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and specific components where impacts differ between the alternatives. Evaluation of impacts associated with subsequent expansion is also provided where relevant. Table 5.6-6 summarizes potentially significant impacts.

Table 5.6-6
Summary of Potential Impacts – Noise

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AMD 4.5 MGD	ALTERNATIVE D-2, 3.5 AMD 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNTATIVE D-2 PUMP FACILITIES
Impact 5.6-1: Expose people to or generate noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies	●[3]	●[3]	--	--	--	◐	○	◐	◐	●	●	●	●	●	●	●	◐
Impact 5.6-2: Expose people to or generate excessive groundborne vibration or groundborne noise levels	◐	◐	--	--	--	○	◐	◐	◐	○	○	○	○	○	○	○	○
Impact 5.6-3: Substantial permanent increase in ambient noise levels in the study area vicinity above levels existing without the Program	◐	◐	◐	◐	--	◐	◐	◐	◐	○	○	○	○	○	○	○	◐
Impact 5.6-4: Substantial temporary or periodic increase in ambient noise levels in the study area vicinity above levels existing without the Program	◐	◐	◐	◐	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

Source: EDAW 2003

Notes: – = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

[3]*Impact is due to construction of corridors, not facility operation.*

Impacts and Mitigation

General Discussion (Applicable to both Alternatives and all Increments)

Noise associated with construction of the proposed desalination plant would result in a temporary increase in ambient noise levels. The majority of construction noise would occur between 8:00 a.m. and 10:00 p.m. for the duration of the proposed Program construction. However, construction of various facilities could occur at night (10:00 p.m. to 8 a.m.).

Construction noise levels at and near proposed Program locations would fluctuate depending on the particular type, number, and duration of use of various types of construction equipment. The effect of construction noise would depend upon how much noise would be generated by construction, the distance between construction activities and the nearest noise-sensitive uses, and the existing noise levels at those uses.

Table 5.6-7 shows typical noise levels generated by construction of commercial and industrial buildings. As shown in Table 5.6-7, the noisiest phases of typical construction (excluding pile-driving activities) would generate approximately 89 L_{eq} at 50 feet. The main noise sources associated with excavation are the operation of excavators removing material and trucks hauling excavated materials away. The main noise sources associated with exterior finishing would be operation of concrete mixers and pumps.

Construction equipment may be considered as point sources of noise, with a noise level attenuation of 6 dBA for each doubling of distance. Additionally, intervening topography and ground cover would provide additional noise attenuation. The assessment of construction noise is based upon maximum noise levels due to construction equipment at a reference distance of 50 feet (Table 5.6-7). With the exception of pile drivers, construction equipment would generate maximum noise levels of approximately 89 dBA at 50 feet. Pile drivers would produce noise levels of approximately 93 dBA at a distance of 50 feet.

Table 5.6-7
Typical Noise Level at Construction Sites

CONSTRUCTION PHASE	AVERAGE NOISE LEVEL AT 50 FEET	
	MINIMUM REQUIRED EQUIPMENT ON SITE	ALL PERTINENT EQUIPMENT ON SITE
Clearing	84 dBA	84 dBA
Excavation	78 dBA	89 dBA
Foundation/Conditioning	88 dBA	88 dBA
Pile Driving	93 dBA	93 dBA
Paving	78 dBA	79 dBA
Finishing and Cleanup	84 dBA	84 dBA

Source: Bolt, Beranek and Newman, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," prepared for the U.S. Environmental Protection Agency 1971

Using a noise attenuation rate of 6 dBA per doubling of distance, the predicted maximum noise level at residences within 1,600 feet of construction sites is expected to be between 89 dBA (50 feet) and 59 dBA (1,600 feet) due to equipment other than pile drivers. If pile drivers are used for construction, the predicted maximum noise level at residences is expected to be between 93 dBA (50 feet) and 63 dBA (1,600 feet).

Construction of the proposed facilities would also generate heavy truck traffic. Based on similar construction projects, construction of the proposed water conveyance pipelines and pumping facilities would each generate approximately four daily truck trips (two-way) and approximately 20 two-way daily construction employee trips. Construction of the proposed desalination plant is expected to generate a total of 10 daily two-way truck trips and 25 two-way construction employee trips during peak periods of construction.

Noticeable noise increases of 3 dBA (CNEL/L_{dn}) typically occur with a doubling of roadway traffic volumes. Noise impacts on sensitive receptors (i.e., greater than 60 dBA CNEL/L_{dn}) do not typically occur until several thousand vehicles are on a roadway. Program-generated construction traffic is not anticipated to substantially increase the number of vehicles on area roadways in comparison to existing roadway volumes.

Operation of the proposed facilities would increase use of motor vehicles, primarily due to employees traveling to and from the desalination plant and routine maintenance and inspection activities. Based on the operation of similar facilities, the proposed Program could require the addition of 10 full-time employees. Assuming an average of two trips per employee, operation of the proposed facilities would result in a maximum of approximately 20 daily employee trips. Based on estimates obtained for similar facilities, routine maintenance and inspection activities, including the delivery of equipment and supplies to the desalination plant, would result in 10 additional trips. Therefore, the total number of daily round-trips on area roadways would be 30.

As previously discussed, a noticeable increase of 3 dBA (CNEL/L_{dn}) typically occurs with a doubling of roadway traffic volume. Due to the relatively low Program-generated traffic volumes, operation of the proposed facilities would not change the traffic noise contours of area roadways and would not result in a substantial increase (i.e., 3 dBA or greater) in average daily noise levels at nearby receptors. As a result, long-term increases in off-site traffic noise levels would be considered less than significant.

Implementation of the proposed Program could increase noise levels in noise-sensitive areas. The potential increases would depend on the design and location of stationary noise-generating equipment. Noise from stationary point sources, such as water pump motors, typically decrease at a rate of about 6 dBA per doubling of distance from the source. For purposes of this analysis, sound levels generated during the various operational activities were estimated based on this noise attenuation rate and assuming the simultaneous operation of identified equipment at each facility. Noise-producing equipment typically associated with these types of facilities includes electrical pump motors and transformers. Depending on the type and size of the pumps required, operational noise levels can range from approximately 65 to 90 dBA at 10 feet. Electrical generators and transformers can generate noise levels of approximately 80 dBA L_{eq} (87 dBA CNEL) at 3 feet (EPA 1971). Additional equipment, such as water filtration and chlorination systems, typically generate noise levels of approximately 58 dBA L_{eq} (65 dBA CNEL) or less at 3 feet (SCWA 2002).

Pumps used for water conveyance systems typically generate noise levels ranging from approximately 70 to 75 dBA at 3 feet. Assuming a maximum noise level of 75 dBA L_{eq} (82 dBA CNEL) at 3 feet and no noise attenuation from intervening structures (e.g., buildings, fences) or vegetation, areas within approximately 50 feet of the pump locations could exceed the City of Santa Cruz's maximum allowable noise standards for stationary sources.

⌦ **Impact 5.6-1: The proposed Program would expose people to or generate noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies. Less than Significant with EIR-Identified Mitigation for the desalination plant component. Significant and Unavoidable for the conveyance facilities component if construction occurs during the nighttime hours.**

<u>Alternatives D-1 and D-2 (Applicable to both Alternatives of all Increments)</u>

Desalination Plant Location

Industrial Park Area. The Industrial Park Area is developed for industrial uses and thus, as a land use, is not considered noise-sensitive. Construction activities in this area would temporarily increase noise levels on surrounding properties. However, due to the nature of the land uses, construction activities would not result in adverse impacts to these properties. Additionally, the proposed Program would conform to the local noise ordinance regarding construction time limits. Construction-related traffic would not substantially increase traffic volumes over those of the existing roadways and is expected to temporarily increase noise levels by less than 3 dBA. Thus, construction of the desalination plant in the Industrial Park Area would not conflict with the City of Santa Cruz noise ordinance.

The primary sources of on-site operational noise would be the electric transformer, filtration activities, and water pumps. Operational noise levels would be greatest at close distances, within 25 feet. At distances greater than 200 feet from the equipment, noise levels would attenuate below 50 dBA. As the Industrial Park Area is surrounded by industrial uses, on-site noise levels are not expected to exceed applicable thresholds of the City's Noise Element or noise ordinance.

Off-site noise would primarily be generated by vehicular activity on local roadways. As shown previously, Program-related traffic volume increases would not result in a significant noise level increase (i.e., 3 dBA or greater) along affected roadways. As a result, off-site operational noise due to the proposed Program would not conflict with applicable regulations.

Shaffer Road/Antonelli's Pond Area. The undeveloped Shaffer Road/Antonelli's Pond Area is bounded on the south by Delaware Avenue, on the east by Shaffer Road, on the north by the

Homeless Garden Project, and on the west by Antonelli's Pond. West of Shaffer Road is the Terrance Point complex, and south of Delaware Avenue is the De Anza Mobile Home Park. Construction activities in this area would temporarily increase noise levels on surrounding properties. Due to the nature of the surrounding land uses, construction activities could result in adverse impacts to these properties. However, the proposed Program would conform to the local noise ordinance regarding construction time limits. Additionally, construction-related traffic would not substantially increase traffic volumes over existing volumes and is not expected to increase noise levels by more than 3 dBA. Thus, construction of the desalination plant in the Shaffer Road/Antonelli's Pond Area would not conflict with the City of Santa Cruz noise ordinance.

The primary sources of on-site operational noise would be the electric transformer, filtration activities, and water pumps. Operational noise levels would be greatest at close distances, within 25 feet. At distances greater than 200 feet from the equipment, noise levels would attenuate below 50 dBA. Because the final layout of the desalination plant is not known, on-site noise levels could exceed applicable thresholds of the City's Noise Element or noise ordinance at the property line of the De Anza Mobile Home Park. Thus, mitigation measures would be required to ensure on-site noise levels generated during operation of the proposed Program would comply with local regulations.

The primary off-site noise source would be vehicular activity on local roadways. As shown previously, Program-related traffic volume increases would not result in a significant noise level increase (i.e., 3 dBA or greater) along affected roadways. Off-site operational noise due to the proposed Program would not conflict with applicable regulations. Please refer to the Industrial Park Area above for a discussion of off-site operational noise impacts.

Terrace Point Area. The Terrace Point Area includes the Terrace Point property, the Long Marine Laboratory, and portions of Younger Lagoon. The area is bordered on the east by the De Anza Mobile Home Park and the Shaffer Road/Antonelli's Pond Area, on the south by the Pacific Ocean, on the west by Younger Lagoon, and on the north by the SPRR tracks (the area north of the railroad tracks is industrial). Construction activities in this area would temporarily increase noise levels on surrounding properties. Due to the nature of the land uses, construction activities could result in adverse impacts to these properties. However, the proposed Program would conform to the local noise ordinance regarding construction time limits. Construction-related traffic would not substantially increase traffic volumes over existing volumes and is not expected to increase noise levels by more than 3 dBA. Thus, while construction activities would temporarily increase noise levels at adjacent properties, construction of the desalination plant in the Industrial Park Area would not conflict with the City of Santa Cruz noise ordinance.

On-site operational noise generated by the proposed Program would primarily consist of noise from the electric transformer, filtration activities, and water pumps. As indicated in the previous discussion, noise levels generated by the operations would be greatest at close distances, within 25 feet. At distances greater than 200 feet from the equipment noise levels would attenuate below 50 dBA. Since the Terrace Point Area is located immediately east of De Anza Mobile Home Park, and the final layout of the proposed desalination plant is unknown, onsite noise levels could exceed applicable thresholds of the City's Noise Element or noise ordinance at the property line of De Anza Mobile Home Park. Thus, mitigation measures would be required to ensure on-site noise levels generated during operation of the proposed Program would comply with local regulations.

Off-site operational noise due to the proposed Program would not conflict with applicable regulations. Please refer to the Industrial Park Area, above, for a discussion of off-site operational noise impacts.

Conveyance and Pumping Facilities

Construction at the booster pump station on the beach near the intersection of West Cliff Drive and Sunset Avenue would increase noise levels at nearby residences north of the proposed pump house. The nearest residences are as close as 50 feet from the proposed pump site. Noise levels at these residences could reach 89 dBA during peak construction efforts.

New water conveyance pipelines would primarily be placed within existing roadways. Noise-sensitive receptors along the alignment routes include residential dwellings, schools, churches, and medical facilities. Construction of the water conveyance pipelines could include the use of backhoes, forklifts, trucks, and various other equipment. Assuming the simultaneous operation of construction equipment, the maximum exterior noise levels would be approximately 89 dBA at a distance of 50 feet. Due to the potential for construction activities to occur between 10:00 p.m. and 8:00 a.m. and within 100 feet of noise-sensitive receptors, nighttime construction activities would not comply with the applicable construction ordinances and thus would result in significant, unmitigable impacts. Unless the Public Works Director authorizes work outside specified hours for this particular project, no mitigation is feasible, as applicable regulations typically do not permit construction outside the specified hours.

Operational noise associated with conveyance facilities would be insignificant, since after construction these facilities would be underground. As previously indicated, operation of the pumps would generate noise levels of 75 dBA at 3 feet, which would attenuate to 50 dBA at 50 feet. The booster pump station would potentially operate 24 hours a day and would represent a continuous noise source. As there are no detailed plans for the pump station, it is not possible to determine if the station would result in noise levels above those identified in the City's noise ordinance. Therefore, when final design plans are available, additional analysis would be required to ensure the proposed pump station would not conflict with the noise ordinance.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Pipelines could be placed along existing roadways or the railroad right-of-way (Corridor 7). Construction activities could generate noise levels that affect sensitive receptors. Assuming the simultaneous operation of construction equipment, the maximum exterior noise levels would be approximately 89 dBA at a distance of 50 feet. Due to the potential for construction activities to occur between 10:00 p.m. and 8:00 a.m. and within 100 feet of noise-sensitive receptors, nighttime construction activities would not comply with the applicable construction ordinances and thus would result in significant, unmitigable impacts. No mitigation is feasible, as the applicable regulations do not permit construction outside the specified hours.

Operational noise associated with conveyance facilities would be insignificant, since after construction these facilities would be underground. The booster pump station would potentially operate 24 hours a day and would represent a continuous noise source. As there are no detailed plans for the pump station, it is not possible to determine if the station would result in noise levels above those identified in the affected jurisdictions' noise ordinances. Therefore, when final design plans are available, additional analysis would be required to ensure the proposed pump station would not conflict with relevant noise ordinances.

Mitigation Measures

Mitigation Measure 5.6-1a: This mitigation measure applies to the desalination component. Stationary noise sources shall be designed and constructed to meet the City of Santa Cruz noise standards. These may include, but are not limited to, the placement of the noise-generating facilities as far as possible from nearby noise-sensitive land uses, and the incorporation of shielding or enclosures. These measures would ensure that operational noise levels at the nearest noise-sensitive land uses comply with the noise standards identified in the City of Santa Cruz noise ordinance. Project-specific mitigation measures would reduce potential impacts to levels at or below standards.

Mitigation Measure 5.6-1b: This mitigation measure applies to the pumping facility component. Project-specific CEQA review shall be conducted prior to the construction of the desalination and pumping facilities to confirm noise effects on adjacent uses. Project-specific mitigation measures would reduce potential impacts to levels at or below standards.

Significance After Mitigation: Less than Significant for the desalination plant component. Significant for the conveyance facilities component for both alternatives if construction occurs at night.

Impact 5.6-2: The proposed Program would expose people to or generate excessive groundborne vibration or groundborne noise levels. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

While the use of heavy construction equipment during excavation and ground compaction would result in minor groundborne vibration, the greatest potential for substantial groundborne noise or vibration would occur if construction of the desalination plant required the use of pile drivers. During high vibration-producing activities such as pile driving, there is a potential for settlement and small movements of nearby structures. However, pile driving is not expected to occur. If it is determined that pile driving would be necessary, then additional project-level evaluation would be required.

<u>Alternative D-2 (Applicable to the First Increment of both Alternatives)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Groundborne noise and vibration impacts would not result from proposed pipeline construction.

<u>Mitigation Measures</u>

Mitigation Measure 5.6-2: This mitigation measure applies to the desalination plant component if pile driving is required. Project-specific CEQA review shall be conducted prior to the construction of facilities if pile driving is required for any phase of the proposed Program. The project-specific CEQA assessment would specifically address the issue of groundborne noise and vibration.

Significance After Mitigation: Less than Significant.

Impact 5.6-3: The proposed Program could result in a substantial permanent increase in ambient noise levels in the study area vicinity. Less than Significant with EIR-Identified Mitigation.

<u>Alternatives D-1 and D-2 (Applicable to both Alternatives of First Increment Only)</u>

Vehicle traffic generated by the proposed Program would increase off-site ambient noise levels. It is assumed that the proposed Program would generate approximately 30 round-trips per day. This increase in traffic on affected local roadways would be minor (i.e., would not increase noise levels on existing roadways by 3 dBA), regardless of the final location of the desalination plant.

Desalination Plant Location

Industrial Park Area. The Industrial Park Area is surrounded by industrial land uses. According to the City's Noise Element, noise levels of up to 75 dBA CNEL are considered "normally acceptable" for industrial land uses. Noise from stationary point sources, such as water pump motors and transformers, typically decreases at a rate of about 6 dBA per doubling of distance from the source. As previously noted, the loudest stationary equipment would generate noise levels on the order of 80 dBA (87 dBA CNEL) at 3 feet. At 12 feet from this source, the noise level would be 75 dBA CNEL. Thus, if all stationary equipment are at least 12 feet from any property line, the proposed Program would be compatible with surrounding land uses. However, the noise ordinance indicates that noise produced on site shall not increase noise levels on surrounding commercial or industrial properties by more than 6 dBA above the ambient noise level. As no final design plans are available, the actual noise level increase cannot be determined. Thus, when final design plans are completed and a final site is selected, a project-specific noise analysis would be required. Mitigation Measure 5.6-1 would mitigate potential noise impacts to a less-than-significant level.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is north of the De Anza Mobile Home Park. According to the City's Noise Element, noise levels of up to 60 dBA CNEL is considered "normally acceptable" for residential land uses, and noise levels of up to 70 dBA CNEL are "conditionally acceptable." Noise from stationary point sources, such as water pump motors and transformers, typically decreases at a rate of about 6 dBA per doubling of distance from the source. As previously noted, the loudest stationary equipment would generate noise levels on the order of 80 dBA (87 dBA CNEL) at 3 feet. At 65 feet from this source, the noise level would be approximately 60 dBA CNEL. Thus, if all stationary noise sources are further than 65 feet from an existing residence, the proposed Program would be compatible with surrounding land uses. However, the noise ordinance indicates that noise produced on site shall not increase noise levels on surrounding residential properties by more than 5 dBA above the ambient noise level. As no final design plans are available, the actual noise level increase cannot be determined. Thus, when final design plans are completed and a final site is selected, a noise analysis would be required. Mitigation Measure 5.6-1 would mitigate potential noise impacts to a less-than-significant level.

Terrace Point Area. Noise impacts to surrounding properties at the Terrace Point Area would be similar to those identified above for the Shaffer Road/Antonelli's Pond Area. Mitigation Measure 5.6-1 would apply to this area and would mitigate impacts to a less-than-significant level.

Conveyance and Pumping Facilities

As conveyance facilities would be placed underground within existing roadways, noise generated by the facilities would not be audible at adjacent properties. The booster pump facilities would potentially be located within a 200 feet of existing residences. As no final design plans are available, the actual noise level increase cannot be determined. Thus, when final design plans are completed and a final site is selected, a noise analysis would be required. Mitigation Measure 5.6-1 would mitigate potential noise impacts to a less-than-significant level.

Alternatives D-1 and D-2 (Applicable to Subsequent Increments of both Alternatives)

Expansion of the desalination plant could require additional facilities that generate noise. It is assumed that similar types of pumps and filtration devices would be used. Mitigation Measure 5.6-1b would also apply to the plant expansion. Therefore, potential impacts would be reduced to less-than-significant levels.

Mitigation Measures

Please refer to Mitigation Measure 5.6-1b, above.

Significance After Mitigation: Less than Significant.

⌧ **Impact 5.6-4: The proposed Program would result in a substantial temporary or periodic increase in ambient noise levels in the study area vicinity. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to both Alternatives of First Increment Only)

Desalination Plant

Construction of the proposed Program would result in a temporary increase in noise levels. An increase of 10 dBA would be considered substantial, as it would be perceived as a doubling of the noise level. As construction activities for the desalination plant would likely generate noise levels of 89 dBA at 50 feet from the source and noise levels in excess of 60 dBA within 1,600 feet, it is likely that the proposed Program would result in a substantial temporary increase in noise levels at nearby receptors around all three of the proposed areas. Mitigation Measures 5.6-4a through 5.6-4d would reduce these potential noise impacts to less-than-significant levels.

Conveyance and Pumping Facilities

Construction of the proposed Program would result in a temporary increase in noise levels. An increase of 10 dBA would be considered substantial, as it would be perceived as a doubling of the noise levels. Construction activities for the conveyance facilities and booster pump station would likely generate noise levels of 89 dBA at 50 feet from the source and noise levels in excess of 60 dBA within 1,600 feet. It is likely that the proposed Program would result in a substantial temporary increase in noise levels at nearby receptors along affected roadways during construction of the conveyance facilities. However, installation of the conveyance facilities would be performed in short linear segments (100 to 200 feet). During this linear construction, pieces of equipment would move along the path and would not remain at a single location for long periods. Therefore, noise level increases associated with construction of the pipelines would be temporary and intermittent, as relatively small areas of each roadway would be affected in a given 24-hour period. Each pipeline segment is expected to require one to two working days to complete. Mitigation Measures 5.6-4a through 5.6-4d would reduce these potential temporary noise impacts to less-than-significant levels.

Alternative D-2 (Applicable to First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Development of the booster pump station under Alternative D-2 would temporarily increase ambient noise levels in the communities of Live Oak and Capitola. Mitigation Measures 5.6-1 and 5.6-4a through 5.6-4d would reduce this potential noise impact to a less-than-significant level.

Alternatives D-1 and D-2 (Applicable to Subsequent Increments of both Alternatives)

Expansion of the desalination plant would result in noise impacts similar to those that would occur for the 2.5-mgd plant. However, the construction duration would likely be shorter and limited to the plant facility. Mitigation Measures 5.6-4a through 5.6-4d would reduce potential impacts to less-than-significant levels.

Mitigation Measures

Mitigation Measure 5.6-4a: Construction equipment shall be properly outfitted and maintained with noise-reduction devices to minimize construction-generated noise. Wherever possible, noise-generating construction equipment shall be shielded from nearby residences by noise-attenuating buffers, such as structures or trucks. Stationary construction equipment shall be centrally located on site at the greatest distance possible from nearby noise-sensitive receptors.

Mitigation Measure 5.6-4b: Impact tools (e.g., jackhammers, pavement breakers, and rock drills) used for proposed Program construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed-air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used; such as mufflers can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, which could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

Mitigation Measure 5.6-4c: Prior to construction of proposed Program facilities, the contractor shall develop and implement a construction noise attenuation plan as needed on a project-by-project basis to reduce noise-related impacts at nearby sensitive receptors to the degree feasible.

Mitigation Measure 5.6-4d: Signs shall be posted at the construction site that include permitted construction days and hours, a day and evening contact number for the job site, and a day and evening contact number for the City in the event of problems.

Mitigation Measure 5.6-4e: This mitigation measure applies to any component if nighttime construction is required. At least 24 hours prior to commencing construction, the City shall notify (in writing) all residents within 300 feet of proposed construction sites of the date and time construction will occur. The notice will provide a contact name, phone number, and a location where noise complaints may be submitted.

Significance After Mitigation: Less than Significant.

REFERENCES

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Sacramento County Water Agency (SCWA). November 2003. *Draft Environmental Impact Report 2002 Zone 40 Water Supply Master Plan*.

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5.7 GEOLOGY, SOILS, AND SEISMICITY

5.7.1 Introduction

This section describes existing geology and soils in the Santa Cruz region. Following a description of existing conditions and regulations, potentially significant impacts associated with the proposed Program are identified, along with mitigation measures to reduce Program-related impacts.

Geotechnical investigations were not conducted for the proposed desalination facility areas or the pipeline corridors. Further studies will be conducted for site-specific locations once they have been selected. Information for the existing conditions overview has been compiled from several reports and documents including:

- *Geologic Map of Santa Cruz County, California*. Brabb, 1997.
- *Oceanographic Predesign Phase Report, Santa Cruz Wastewater Facilities Planning Study*, Brown and Caldwell, August 1978.
- *City of Santa Cruz General Plan and Local Coastal Program 1990–2005*. 1992.
- *The Ancient Beaches of Santa Cruz*. Helatite Field Outing, Rowe and Rilhimaki, February 2003.
- *Soil Survey of Santa Cruz County*, Natural Resources Conservation Service, 1976.
- *Geological Survey, Geologic Map, Felton-Santa Cruz Area*, United States Geologic Survey, 1966.
- *Overall Watershed Characterization–National Map,*. United States Environmental Protection Agency, 2003.
- *Earthquake Probabilities in the San Francisco Bay Region: 2002–2031*, United States Geologic Survey Working Group on California Earthquake Probabilities, 2003.

5.7.2 Existing Conditions

Regional Setting

Topography

The dominant topographic features in the study area vicinity are a series of emergent marine terraces at varying elevations above mean sea level. Each terrace reflects a period of cliff and wave-cut platform erosion during a high-stand in sea level during the Quaternary period (1.6 million years ago [mya] to present). A large portion of the western side of the city is built on the first of these terraces, at approximately 65–100 feet above sea level. From there, the ground slopes gently upwards to the foothills of the Santa Cruz Mountains to the north, the rise interrupted intermittently by additional marine terraces at approximately 80, 125, 175, and 225 meters (approximately 250, 410, 575, and 725 feet) (Rowe and Riihimaki 2003). The Bay Street Reservoir sits atop the 250-foot marine terrace at the top of Bay Street. The center of the city is below the lowest marine terrace in the floodplain of the San Lorenzo River. Where creeks cut across the terrace, they often form steep gullies and canyons. Moore Creek forms one such canyon on the city's western boundary. Between the San Lorenzo River and Soquel Creek, the marine terrace is broken into three sections by Arana Gulch and

Rodeo Gulch. To the north of the marine terraces, the Santa Cruz Mountains rise to summit elevations of several thousand feet.

Geology

The study area vicinity is part of the Coastal Range Geologic Province, a series of tall mountains trending northwest along the central coast of California and consisting of folded and faulted Tertiary (65–1.6 mya) marine and non-marine formations, and Cretaceous (140–65 mya) marine formations. Underlying the formation are granitic and basaltic basement rocks of the Salinian block. These are overlain by Pleistocene (1.6 mya to 10,000 years ago [ya]) marine terrace deposits, and recent alluvial and colluvial deposits.

The project region between Moore Creek and Soquel Creek is a combination of elevated marine terraces, low floodplains, and erosive features such as gullies and canyons. Most of the westside marine terrace is overlain by sedimentary marine deposits from the mid-Quaternary or Pleistocene. Moving north towards the hills, these give way to non-marine slopewash and colluvial deposits. Holocene (10,000 ya–present) deposits exist in the lowlands in the vicinity of the WWTP. Where rivers cut through the marine terrace, they expose sedimentary and volcanic rock from the upper Miocene (23.7–5.3 mya). The Santa Cruz Mudstone and Purisima formations are exposed in the sea cliffs along West Cliff Drive. They are a silicious mudstone and sandy siltstone, and a friable to weakly cemented silty sandstone and sandy mudstone, respectively. These formations tend to dip at low angles to the southeast and southwest beneath Monterey Bay, while the overlying terrace deposits are essentially flat. The Santa Margarita Sandstone formation is exposed north of the Terrace Point Area in the foothills of the Santa Cruz Mountains. A large region of Holocene alluvium exists around the downtown district, which is located in the floodplain of the San Lorenzo River.

Offshore surficial geology is a complex mosaic of shale, sandstone, and mudstone reef interspersed between areas of sand. Marine geophysical data from the 1978 Brown and Caldwell report indicate the presence of three offshore geologic formations: the Santa Cruz Mudstone formation, the Purisima formation, and Quaternary unconsolidated marine sediments. The Purisma formation is exposed in a 3,000-foot-wide zone of the seashore extending southwest from Point Santa Cruz. Offshore from Wilder Beach, one mile west of the city, the Quaternary sediments occur up to depths of about 25 feet and are characterized by loose, fine- to medium-grained, silty sands and medium gravels. Bottom conditions in the offshore area vary from a relatively smooth, sandy bottom to rough, rocky, and bouldery areas.

Seismicity/Faulting

The north-central coast of California is one of the most seismically active regions in the United States. The San Gregorio–Palo Colorado fault, the nearest major fault to the study area, is located about 10 miles offshore, running north-northwest. The San Andreas fault runs northwest and is approximately 20 miles east of the study area. Other large active faults in the area include the Hayward and Calaveras faults, the southern ends of which lie approximately 25 miles northeast. Several smaller faults exist locally, including the Monterey Bay and Corralitos Fault Complexes and the Butano, Sargent, Tularcitos, Zayante, and Ben Lomond faults (Figure 5.7-1).

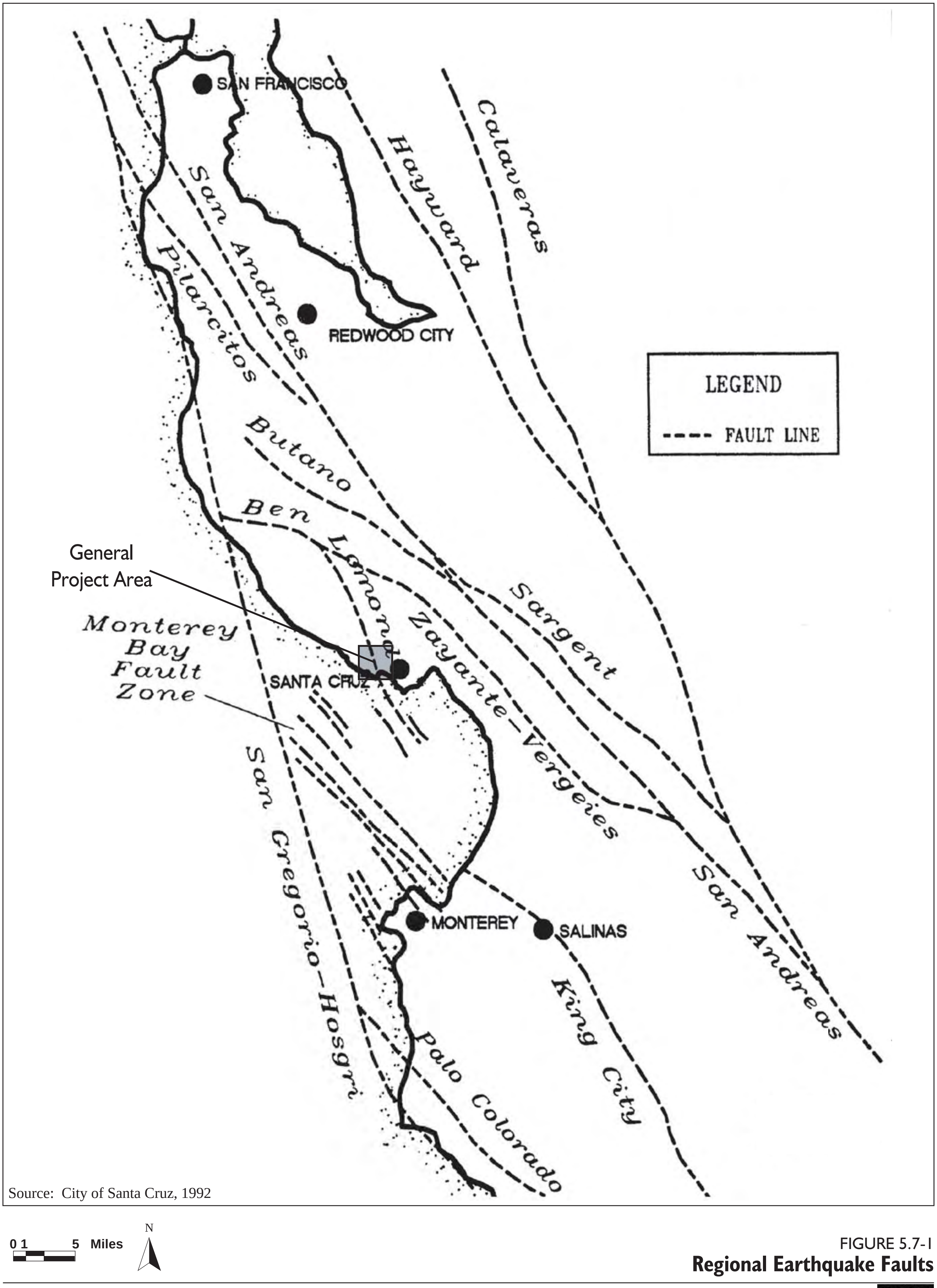

FIGURE 5.7-1
Regional Earthquake Faults

The recorded earthquake history of the area began in 1836, with high-intensity earthquakes occurring in the 1890s and 1900s. More recently, major earthquakes associated with the San Gregorio–Palo Colorado and San Andreas faults have occurred in 1963, 1971, and 1989. In the Loma–Prieta earthquake of 1989, the city of Santa Cruz was one of the hardest hit communities, suffering over 1,400 job losses due to damage in the downtown district. The study area vicinity has a high potential for future seismic activity and may be particularly affected by the San Andreas fault which, while further away, has a higher Richter scale magnitude capability. The potential for earthquake shaking from the minor faults in the area, including the Monterey Bay Fault Complex, is considered small when compared to both the San Andreas and San Gregorio faults. The maximum probable earthquake is a Richter magnitude 8.25 on the San Andreas fault, with a probable recurrence interval of 100 to 1,000 years (USGS 2003). The probability of a large-magnitude earthquake occurring on the San Andreas fault between Santa Cruz and Point Reyes within the next 30 years is approximately 21 percent (USGS 2003). The duration of a maximum probable earthquake would be up to one minute for the San Andreas fault, and about 20–30 seconds on the San Gregorio fault.

Liquefaction/Subsidence Potential

Liquefaction, a common cause of ground failure, is the process by which water-saturated sediment temporarily loses strength and acts as a fluid. It is most commonly caused by ground shaking due to earthquakes. The City of Santa Cruz has several high-liquefaction-potential areas. The largest occurs near the business district in the alluvial floodplain of the San Lorenzo River, and in the low areas near the coast (City of Santa Cruz 1992). The alluvial floodplain of Moore Creek, Arana Gulch, and Schwann Lake are also considered to have high liquefaction potential.

Lateral Spread

Lateral spread is the movement of near-surface soil, generally along a near-surface liquefiable layer. It can occur on flat to gently sloping ground and is particularly common near the free surface of gullies or channels, or where groundwater is shallow. The lower ground surface in a channel provides a point of release for the increased pressure of liquefaction, causing the surface layer to move laterally toward the channel. Documentation of local lateral spread is not available, but is assumed to overlap with areas where liquefaction is common. Sediments in the downtown district experienced some lateral spread during the 1989 Loma-Prieta earthquake (Santa Cruz County 1994).

Landslides

Landslides in Santa Cruz tend to be most common in areas with slopes above 30 percent. Highest landslide risk is therefore along the seacliffs at West Cliff Drive, on steep slopes between the marine terrace levels, and in canyons or depressions formed by creeks.

Tsunamis and/or Seiche Waves and Storm-Induced Erosion

There is no historical record of flooding of the coastal terrace due to seismic sea waves, or tsunamis. The absence of human-made structures such as groins and jetties along West Cliff Drive allows for unhindered alongshore transport of sand, and decreases the incidence of beach and sea-cliff erosion. Because the existing outfall pipe is buried and armored, it can withstand normal seasonal fluctuations in beach sand levels and is protected from wave attack. The existing junction structure is similarly armored and can withstand tidal and wave action.

Study Area

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant Location

Industrial Park Area. The Industrial Park Area is located on relatively flat, open ground on the first of the marine terraces, at an elevation of 65–100 feet above sea level. With the exception of a small rise at its center, just east of the realigned and restored Arroyo Seco Canyon Creek and the Lipton Building, the land is sparsely vegetated, with pockets of denuded areas and exposed soil occurring throughout the property. The small rise is topped by several scattered willows (EDAW 2003). Water erosion and landslide potentials are low due to highly permeable soils on shallow slopes and erosion-abatement practices in areas of exposed soil. A small swale that runs through the property and drains to Arroyo Seco Canyon Creek currently has coconut fiber rolls in place to prevent excessive erosion (EDAW 2003).

There are no known active faults in the Industrial Park Area; however, the area is subject to low-intensity seismic shaking during earthquakes (U.S. Department of the Interior 1966). Liquefaction and lateral spreading potential of the sediments is likely low, because the water table is generally below the terrace deposits and ground surface slopes are shallow (Dupre and William 1975). Site-specific geological analysis will be needed to accurately determine liquefaction potential. A thick layer of Watsonville loam is the dominant soil type in the Industrial Park Area, with only a small finger of Elkhorn sandy loam extending into its southwest corner (NRCS 1976).

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is located on gently south-sloping open ground on the first of the marine terraces, at an elevation of 65–80 feet above sea level. The land is sparsely vegetated by grasses and mixed herbaceous plants. The eastern edge of the area borders Antonelli's Pond and slopes eastward into the riparian corridor on the pond's edge (EDAW 2003). Water erosion and landslide potentials are low due to highly permeable soils on shallow slopes.

There are no known active faults in the Shaffer Road/Antonelli's Pond Area, which is subject to low-intensity seismic shaking during earthquakes (U.S. Department of the Interior 1966). However, the adjacent Moore's Creek drainage and its floodplain are subject to very intensive seismic shaking. Liquefaction and lateral spreading potential of the sediments is likely low on the area of the site outside of the floodplain, because the water table is generally below the terrace deposits and ground surface slopes are shallow (Dupre and William 1975). Proximity to the pond and slightly steeper slopes may increase the risk of lateral spreading along the eastern edge of the property. Soils in the area are primarily Elkhorn sandy loam, with thick Watsonville loam close to Antonelli's Pond, and Baywood loamy sand on the northern edge of the property (NRCS 1976).

Terrace Point Area. The Terrace Point Area is located on gently south-sloping open ground on the first of the marine terraces, at an elevation of 65–80 feet above sea level. Water erosion and landslide potentials are low.

There are no known active faults in the Terrace Point Area. The area experiences low seismic shaking during earthquakes (U.S. Department of the Interior 1966). Liquefaction potential of the sediments is likely low on the area, because the water table is generally below the terrace deposits and ground surface slopes are shallow (Dupre and William 1975). The western edge of the area may be at greater risk of lateral spreading due to proximity to the steep slopes adjacent to Younger Lagoon. In addition, wetland areas may be at greater liquefaction risk. Soils in the Terrace Point Area consist of thin- and thick-surfaced Watsonville loam close to the north and south portions of the property, with some intervening Elkhorn sandy loam (NRCS 1976).

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1), and Concentrate Discharge Pipeline (Corridors 1 and 4). The raw water intake and concentrate discharge pipeline corridors occur on the relatively flat ground of the first marine terrace at 65–100 feet above sea level. In most cases, the pipelines would be trenched along existing roads. Water erosion and landslide potential are considered low on the entire marine terrace. There are no known active faults along or crossing Corridors 1 or 4. A section of Moore's Creek is considered to be within an area of high potential seismic shaking, liquefaction, and lateral spreading (U.S. Department of the Interior 1966; Dupre and William 1975). Soils along the corridors are a mixture of thin and thick Watsonville loam, Elkhorn sandy loam, and Baywood loamy sand (NRCS 1976).

Junction Structure. According to the City's General Plan (1992), the sea cliffs along West Cliff Drive are considered hazardous and at high risk of cliff erosion. In 1983, storms produced up to 40 feet of erosion of unconsolidated material lying atop the low bedrock terrace along Westcliff Drive. Part of the sea cliff near the current wastewater outfall structure is rip-rapped to provide protection from storm waves. Seismic shaking, liquefaction, and lateral slip potential are considered low along the sea cliffs but high on the beaches (U.S. Department of the Interior 1966; Dupre and William 1975). Soils along the sea cliff and on the beach are thick Watsonville loam and unconsolidated sand, respectively (NRCS 1976).

Treated Water Distribution Pipeline (Corridors 2 and 3). In addition to occurring on the first marine terrace (described above), the treated water distribution pipeline corridors also travel up to the Bay Street Reservoir on the second marine terrace. This includes an area of steeper slope on Western Drive and Bay Street. With the exception of the lower section of Western Drive (Corridor 2), water erosion and landslide potential are considered low along these corridors, as the slopes do not generally exceed 30 percent. There is no known active fault along or crossing Corridors 2 or 3. Areas with high potential for seismic shaking, liquefaction, and lateral spreading are similar to those previously described (U.S. Department of the Interior 1966; Dupre and William 1975). For the Industrial Park Area, all pipeline corridors are in low seismic shaking zones. Soils along the treated water distribution pipeline corridors are a mixture of thin and thick Watsonville loam, Elkhorn sandy loam, Baywood loamy sand, Aptos loam, Bonnydune loam, and Bonnydune rock outcrop complex (NRCS 1976).

Alternatives D-2 (Applicable to the First Increment of this Alternative Only)

D-2 Distribution Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility, which begin at the intersection of Ocean Street and Water Street one block east of the San Lorenzo River. Water erosion and landslide potential are generally low along these corridors, as the slopes do not exceed 30 percent. Slightly steeper slopes occur on the rise up to the first marine terrace. There are no known faults along or crossing Corridors 5, 6, and 7. However, areas of high seismic shaking, liquefaction, and lateral spreading potential along the distribution routes include the lowlands around the San Lorenzo River, Arana Gulch, Schwann Lake, and Rodeo Gulch (U.S. Department of the Interior 1966; Dupre and William 1975). Soils along the D-2 distribution pipeline corridors are a mixture of thin and thick Watsonville loam, Elkhorn sandy loam, Baywood loamy sand, Pinto loam, Elder sandy loam, and Soquel loam (NRCS 1976).

5.7.3 Regulatory Framework

Any proposed Program component within the scope of the IWP would be subject to federal, state, and local regulations and codes pertaining to soils, geology, and seismicity, as detailed below.

Building Codes

The Uniform Building Code (UBC) and the California Building Code (CBC) are standards that dictate seismic design for buildings in California. Recommended by the International Conference of Building Officials, the UBC is adopted worldwide. The CBC incorporates the UBC, with necessary additions for building conditions in California. The CBC is included in Title 24 of the California Code of Regulations (CCR), which in its entirety is referred to as the California Buildings Standard Code (CBSC). The California Building Standards Commission is responsible for coordinating all enforceable building standards into Title 24 of the CBSC.

Local

The City of Santa Cruz

The *City of Santa Cruz General Plan and Local Coastal Program* contains policies pertaining to soil and seismicity in its Environmental Quality and Safety Elements. The elements relate to the prevention of soil and cliff erosion and reduction of risk to people and property from seismic activity. Relevant policies are provided in Appendix B of this document.

Santa Cruz County

The *Santa Cruz County General Plan and Local Coastal Program* contains policies pertaining to soil, geology, and seismicity in its Public Safety and Noise Element and Safety Element. The Public

Safety and Noise Element includes policies relevant to erosion control in the study area. Relevant policies are provided in Appendix B of this document.

<u>The City of Capitola</u>

The Conservation Element of the *City of Capitola General Plan* outlines policies regarding soils, geology, and seismicity. Relevant policies are provided in Appendix B of this document. Policy 14 of the Local Coastal Program conservation section, indicates that erosion and runoff regulations shall be enacted.

5.7.4 Impacts and Mitigation Measures

Significance Criteria

CEQA defines a significant effect on the environment as a substantial, or potentially substantial, adverse change in the physical conditions within the affected area. According to the *CEQA Guidelines,* the proposed Program would be considered to have significant geology-related impacts if it would:

- Expose persons or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault,[2] strong seismic ground shaking, or seismic-related ground failure, including liquefaction or landslides;
- Be located on strata or soil that is unstable, or that would become unstable as a result of the proposed Program, and potentially result in lateral spreading, subsidence, liquefaction, or collapse;
- Be located on corrosive or expansive soil creating substantial risks to life or property. Per the *CEQA Guidelines*, expansive soil is defined in Table 18-1-B of the UBC; or
- Result in substantial soil erosion or the loss of topsoil (this impact is principally covered in Section 5.1).

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Subsequent expansion of the plant is not anticipated to require additional facilities outside of the 2.5-mgd plant footprint. Therefore, no additional evaluation of potential geologic-related impacts is provided for plant expansion. If additional facilities are determined to be necessary at the time of expansion, they would be appropriately evaluated. Table 5.7-1 summarizes potentially significant impacts.

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2 Per the *CEQA Guidelines*, a known earthquake fault is one that has been delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.

Table 5.7-1
Summary of Potential Impacts – Geology, Soils, and Seismicity

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.7-1: Potential damage to proposed Program facilities and/or persons involved in construction and operation of facilities (including loss, injury or death) due to seismic hazards	◐	◐	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.7-2: Potential for soil erosion and sedimentation from construction activities	◐	◐	--	--	--	◐	○	○	○	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.7-3: Damage to Program facilities from corrosive or expansive soils	◐	◐	--	--	--	○	○	○	○	○	○	○	○	◐	◐	◐	◐

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

[2]Impacts associated with the specific facilities of the desalination plant.

Impacts and Mitigation

⌧ **Impact 5.7-1: Potential damage to Program facilities and/or persons involved in construction and operation of facilities (including loss, injury or death) could result from seismic hazards. Less than Significant with EIR-Identified Mitigation.**

<u>General Discussion (Applicable to both Alternatives)</u>

As discussed in the setting section, the study area is subject to intense ground shaking from nearby faults. This unavoidable hazard poses significant risk to structures in the study area, including roads, bridges, buildings, water storage facilities, utilities, and buried and surface pipelines. There are a variety of hazards related to earthquake events, including ground shaking, ground rupture, liquefaction, lateral spread, landsliding, and flooding due to dam failure. The hazards posed to any particular facility would depend on the geology and location of the site as well as the construction specifications of the facility.

Physical injury to persons working at the desalination facility during construction and operation could potentially occur during a seismic event. In addition, facilities could also be damaged due to seismic-related hazards.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant Location

There are no known active faults at any of the potential desalination areas. The potential for seismic shaking at all of the areas is considered to be low (U.S. Department of the Interior 1966); liquefaction and lateral spreading potential are also considered low, for the following reasons: the water table is generally below the marine terrace deposits, sediments are cohesive, and ground surface slopes are shallow (Dupre and William 1975).

Shaffer Road/Antonelli's Pond Area. A small section of this area adjacent to Moore Creek may be susceptible to a high liquefaction potential due to its location within the 100-year floodplain, and a slightly larger area is susceptible to very intense shaking during seismic events (U.S. Department of the Interior 1966). However, because the construction setback from Moore Creek is required to be at least 100 feet (see Section 5.4, Biological Resources), the facility would not be affected by areas of high liquefaction.

Conveyance and Pumping Facilities

There are no known active faults on any of the D-1 pipeline corridors. All of the D-1 pipeline corridors are located on the marine terrace, which is generally not susceptible to intense seismic shaking, liquefaction, or lateral spread, as previously explained. Proper pipeline design would further minimize any potential risks. However, where pipelines cross creek corridors or are located on steep slopes, the potential risk may increase. Alluviated valleys are of particular concern due to their loose sediment structure. All of the pipeline corridors have the potential to cross Moore Creek. Moore Creek is the largest creek in the D-1 study area, and sediment in and around Moore Creek may be susceptible to greater risk from seismic shaking, liquefaction, and lateral spread.

Raw Water Intake Pumping Facility. The pumping facility for the raw water intake could be located between the base of the sea cliffs and the ocean. This area of sand has a high risk for liquefaction and lateral spread. Design of the pump facility and the geological limitations of the site will require particular scrutiny. Similar attention to seismic constraints will be required when designing and constructing the raw water intake structure, which is located on unconsolidated marine sediments (Brown and Caldwell 1978).

Raw Water Intake Pipeline (Corridors 1). Corridor 1 may be subject to increased risk from seismic hazards where it crosses Moore Creek and Arroyo Seco Canyon Creek.

Treated Water Distribution Pipeline (Corridors 2 and 3). Corridors 2 and 3 may be subject to increased risk from seismic hazards, particularly where the pipeline occurs on the steep slope of Western Drive, and where it crosses Moore Creek, Arroyo Seco Canyon Creek, and Bay Creek.

Concentrate Discharge Pipeline (Corridors 3 and 4). Corridors 3 and 4 may be subject to increased risk from seismic hazards where the pipeline crosses Moore Creek and Arroyo Seco Canyon Creek.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. No known active faults cross any of the corridors. Pipeline integrity would be at risk where the pipelines are buried on steep, unstable slopes or in unconsolidated sediments prone to liquefaction or intense shaking. The western terminus of Corridors 5, 6, and 7 lies within the San Lorenzo River and Branciforte Creek floodplains, an area that is subject to very intense seismic shaking and has a moderately high potential for liquefaction (U.S. Department of the Interior 1966; Dupre and William 1975). Corridor 7 is exposed to additional risk of very intense seismic shaking where it continues south along Ocean Street (which remains in the San Lorenzo River floodplain), and as it crosses Arana Gulch and Rodeo Gulch (U.S. Department of the Interior 1966). Corridor 7 is also subject to high liquefaction potential along portions of Ocean Street and Murray Street, and where it crosses Arana Gulch, Schwann Lake, and Rodeo Gulch (Dupre and William 1975). Corridors 5 and 6 are exposed to very intense shaking and moderately high liquefaction potential where they cross Arana Gulch and Rodeo Gulch.

The D-2 pumping facility could be located in an area with seismic instability or intense ground shaking. Relative risk would depend on the pump facility's final location.

Mitigation Measures

Mitigation Measure 5.7-1a: This mitigation measure applies to all proposed Program components. Once final pipeline route, pumping facility, and desalination plant locations have been selected, a geotechnical engineer shall complete a design-level geotechnical investigation and implement site-specific recommendations for Program design and construction. The report shall indicate the potential for seismic hazards at the desalination areas and along the final pipeline alignments, as needed. Recommendations of the geotechnical engineer shall be incorporated into the design and construction specifications to reduce seismic-related hazards. These recommendations may include, but will not be limited to:

- Bury pipelines and foundations below liquefiable material
- Remove liquefiable material on the project sites and use a stable replacement
- Weld all joints in areas at high risk from geologic hazards
- Compact and dewater soils around pipeline alignments and foundations

- Avoid specific portions of the desalination plant areas (potentially the Shaffer Road/Antonelli's Pond Area) that are found to be prone to seismic hazards

Mitigation Measure 5.7-1b: This mitigation measure applies to all Program components. All facility designs shall comply with the most recent edition of the UBC or local building codes if they are more stringent. This is standard procedure for all construction projects.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.7-2: Construction of Program facilities has the potential to cause soil erosion, loss of topsoil, and sedimentation. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to both Alternatives)

This potential impact is covered to a large extent by the discussion provided for Impact 5.1-1 (Section 5.1, Hydrology and Water Quality). Mitigation Measures 5.1-1a, 5.1-1b, and 5.1-1c, including the acquisition of a construction general permit from the Regional Water Quality Control Board (RWQCB) and preparation and implementation of a stormwater prevention plan, would also apply. Additional concerns not discussed in Section 5.1 include failure of the walls in pipeline trenches or pits associated with underground construction, and bank or slope failure where pipelines cross waterways, areas of noncohesive sediments, or steep slopes. Construction on areas of steep or unstable slope, particularly slopes above 30 percent, has the potential to induce or exacerbate soil erosion through landsliding.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

As discussed in Section 5.1, several construction-related activities at the desalination facility could result in erosion or loss of topsoil. Construction on steep slopes, particularly slopes above 30 percent, are at additional risk; however, none of the desalination plant areas are located on steep or unstable slopes.

Conveyance and Pumping Facilities

Construction-related activities associated with pipeline installation are also discussed in Impact 5.1-1 (Section 5.1, Hydrology and Water Quality). In addition, failure of the pipeline trench wall could potentially occur between excavation and backfilling. If pipeline construction occurs during a heavy rain event, or in noncohesive or saturated soils, there would be a greater potential for the trench walls to collapse, and additional shoring could be required. If erosion of the pipeline trench walls occurs, water from dewatering activity could contain more sediment and thus pose a risk to nearby waterways. Pipelines constructed in noncohesive sediments or on steep or unstable slopes are more likely to cause or be exposed to erosion and loss of topsoil.

Raw Water Intake Pumping Facility. The sea cliffs along Westcliff Drive are particularly prone to erosion and massive cliff failures. The proposed pump station would be located at the base of the cliffs, either within the existing junction structure or as a stand-alone structure. Construction in this area has the potential to induce cliff failure or erosion and cause sedimentation in the nearshore environment. Failure could occur due to the weight of construction equipment, vibration associated with construction, or denuding of cliffside vegetation in the construction and staging areas. Parts of the cliff along this section of Westcliff Drive have been stabilized by rip-rap consisting of very large boulders; additional cliff stabilization could be required to protect any new structures.

Raw Water Intake Pipeline (Corridor 1). The raw water pipeline is not located on any known areas of unstable slope.

Treated Water Distribution Pipeline (Corridors 2 and 3). The treated water distribution pipeline could be partially located on an area of unstable sediments or slopes where it follows Corridor 2 along Western Avenue. However, construction in this area is unlikely to cause slope failure or erosion, as the pipeline would be trenched into the road. Sediments on the steep sections of Western Drive could be less cohesive than those on the flatter sections, and pipeline trench walls could be more prone to failure along this section. The treated water distribution pipeline, Corridor 3, is not located on any areas of unstable slope.

Concentrate Discharge Pipeline (Corridors 1 and 4). The concentrate discharge pipeline, Corridor 4, is not located on any areas of steep or unstable slope.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Steep or unstable sediments and slopes could occur in areas near small creeks and other waterbodies (e.g., Arana Gulch, Schwann Lake, Rodeo Gulch, and Corcoran Lagoon) and in the floodplain of the San Lorenzo River. Erosion impacts could result from failure of the pipeline trench or due to steep or unstable slopes. The Alternative D-2 pumping facility has not yet been sited, but could be located on an area of unstable slope.

<u>Mitigation Measures</u>

Mitigation Measure 5.7-2a: This mitigation measure applies to the proposed pipeline components. As part of the geotechnical investigation (see Mitigation Measure 5.7-1a), a survey of slope stability at selected sites shall be conducted by a geotechnical engineer. Recommendations based on the survey shall be incorporated into the construction specifications, which may include the following:

- Install additional shoring in trenches where sediments are noncohesive or saturated
- Bury pipelines at a greater depth to reduce risk from landslides, or to key into more stable sediment

- Improve roads or embankments across drainages in areas where pipeline installation has the potential to cause erosion

Mitigation Measure 5.7-2b: This mitigation measure applies to proposed pipeline components. Contractors shall implement shoring of the trench walls, as needed, to prevent slumping or caving of sediment from the pipeline trench walls. If pipeline construction occurs during a heavy rain event or in noncohesive or saturated soils, the potential for the trench walls to collapse would increase, and additional shoring could be required. In addition, contractors shall minimize the amount of time that the trench remains open. If erosion of the pipeline trench walls occurs, water from dewatering activity could contain more sediment and thus pose a risk to nearby waterways. In the event that dewatering is needed, contractors shall monitor and maintain sediment traps or stormwater filters, or perform other BMPs for sediment reduction and erosion control (see Mitigation Measure 5.1-1 regarding implementation of BMPs).

Significance After Mitigation: Less than Significant.

Impact 5.7-3: The proposed Program facilities could be sited in areas of corrosive or expansive soils. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Expansive and corrosive soils have the potential to damage facilities. Expansive soils shrink when dry and swell when wet. This movement can exert enough pressure to crack sidewalks, driveways, pipelines, and foundations. The soil types in the study area (Watsonville loam, Elkhorn sandy loam, Baywood loamy sand, Watsonville loam, Pinto loam, and Soquel loam) are not considered expansive soils.

Corrosive soils cause corrosion of underground ferrous and concrete components, including pipelines and foundations. Soil corrosion is a complex phenomenon, with a multitude of variables; corrosion generally occurs in soils with high moisture content, high electrical conductivity, high acidity, and high dissolved salts. Pinto loam and Soquel loam, which are present along the D-2 pipeline corridor, are considered medium-acid soils, which have a potential to be corrosive.

Mitigation Measures

Mitigation Measure 5.7-3: As part of the geotechnical survey (see Mitigation Measure 5.7-1), a site-specific soil survey shall be conducted along the D-2 pipeline corridor to identify areas of corrosive soils. For areas with corrosive soils , a geotechnical engineer shall make recommendations regarding alternative construction materials and methods. Recommendations may include excavation and replacement of highly corrosive soils with appropriate fill material.

Significance After Mitigation: Less than Significant.

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5.8 CULTURAL RESOURCES

5.8.1 Introduction

This section describes existing cultural resources in the vicinity of the study area, as well as policies and regulations relevant to cultural resources. In addition, this section presents an evaluation of the potential impacts on cultural resources that would result from Program implementation and measures to reduce such impacts.

An assessment of cultural resource issues for the proposed Program consisted of a documentary record search conducted through the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS). The NWIC provided detailed information on previously recorded sites and studies within and near the study area. This information was analyzed by EDAW cultural resource specialists to determine if the proposed Program would adversely affect any prehistoric or historic sites, features, or artifacts documented within and in the vicinity of the proposed pipeline corridors.

5.8.2 Existing Conditions

Ethnographic Setting

The central California coast, including the study area, lies within the historic ethnographic territory of the Ohlone Indians. The Ohlone are a Costanoan (or Penutian)–speaking people who arrived in the area around A.D. 500. They inhabited the area from central San Francisco Bay to Monterey and east to the crest of the Coast Ranges. Ohlone settlement patterns were based on triblet groupings, with kinship or marriage ties between specific settlements. Each triblet might be represented by one or more permanent villages and camps within their territories (Kroeber 1925; Levy 1978; Moratto 1984).

The Ohlone followed a seasonal round of food exploitation, breaking into small groups to obtain foodstuffs, or occasionally moving entire villages to take advantage of food availability. Ohlone territory included grassland, woodland, chaparral, coastal, estuarine, and tidal marsh environments. Tule reeds were extensively used, as were brush, grass, or thatch, to make boats, rafts, or houses. Sweat lodges, dance houses, and assembly houses would have been important components in any village. Cemeteries were frequently located near the edge of a village (Kroeber 1925; Levy 1978).

Subsistence patterns were based on careful management of the land. Controlled burns were carried out each fall to promote the growth of annuals and to increase grazing areas for deer, elk, and antelope. Plants were pruned annually and reseeded for higher production. Acorns were available from four varieties of oak and provided a staple part of the diet. Buckeye nuts and hazelnuts were also eaten. A variety of plant seeds and berries were collected for food. Other edible plants probably utilized by the regional Native Americans included such flora as wild onion, cattail roots, chuchupate, amole, and wild carrots. A wide variety of mammals, reptiles, fowl, fish, and mollusks were also gathered for food (Levy 1978; Kroeber 1925).

Prehistoric Setting

Based on archaeological and ethnographic evidence, the study area may have acted as a transition zone between the ancestral Costanoans and the ancestral Esselen (Moratto 1984). The local economy appears to have been more focused on gathering than hunting, and the remains of numerous camp sites, villages, and shell middens have been documented within and near the study area since the 1870s. Over time, broad technological, social, and economic systems developed within the central regions of California and can be seen in the archaeological record. In general, as populations increased and more extensive use was made of the landscape, datable archaeological materials gradually became more commonplace. As a result, later periods of early Native American occupation of the region are better understood.

Historic Setting

The Santa Cruz area was crossed by a number of Spanish exploration routes, including those by the Portola-Crespi (1769), Ortega (1769), Fages (1770), Anza-Font (1776), and Rivera-Palou (1775) parties. The favorable climate, fertile soils, and reasonably friendly Native American inhabitants resulted in the area being chosen for the site of Mission Santa Cruz in 1791 (Beck and Haase 1974); the town of Santa Cruz itself grew around the original mission plaza. After Mexican independence from Spain, former mission lands were greatly reduced and partially diverted into Mexican land grants. The study area includes lands from two small grants, Arroyo del Rodeo (1,473 acres) and Shoquel (1,668 acres) (Beck and Haase 1974). Arroyo del Rodeo was given to Francisco Rodriguez in 1834, an early California poet (Hoover et al. 1990). Rancho Shoquel (Soquel) as well as a larger grant, Rancho Soquel Augmentacion, were given to Martina Castro in 1833. Cattle raising on the ranchos formed the dominant part of the economy during the Mexican period and provided meat, hides, and tallow. John C. Fremont and his party camped in the Santa Cruz area on March 1, 1846, signaling the eventual American administration of the Mexican territory.

Sawmills, tanbark harvesting, and lime kilns operated in the area beginning in the mid-19th century. As there were few wagon roads or railroads to the area, most goods were transported in and out via schooners that would land at inlets at the mouths of streams. Additional economic and industrial pursuits established in the area during the 1800s included a large whaling port at Davenport Landing and several stage routes that connected Santa Cruz and San Jose, beginning in 1854.

In general, the Santa Cruz area remained a prosperous agricultural center prior to the middle of the 20th century. Following the World War II era, the development of the region as a major tourist and recreational area produced a major shift in the economy. Although agriculture is still a major contributor, the economic base of the Santa Cruz region is much more diverse than in previous decades.

Regional Setting and Study Area

The NWIC record search indicates that 30 prehistoric and historic cultural resources have been documented in and near the study area, of which 11 are directly within the study area and most likely to be affected by Program implementation. The remaining 19 resources are within one-quarter mile of the proposed facilities. The recorded resources, their types, approximate locations, and relevance to the proposed components are shown in Table 5.8-1.

Table 5.8-1
Cultural Resources Within and Adjacent to the Study Area

RESOURCE #	TYPE OF RESOURCE	RESOURCE DESCRIPTION	RELATIONSHIP TO PROPOSED PROGRAM COMPONENT
CA-Scr-139	Prehistoric	Occupation site, partially disturbed	East of Wharf Road, near Corridor 6
CA-Scr-168	Prehistoric	Large occupation site	Adjacent to/under Robertson Street and Wharf Road, near Corridor 5
CA-Scr-171	Prehistoric	Midden site	East of Wharf Road, near Corridor 6
CA-Scr-187	Prehistoric	Midden site	Adjacent to Murray Street and the San Lorenzo River, near Corridor 7
CA-Scr-200	Prehistoric	Lithic and shell scatter	North of Soquel Drive, near Corridor 5
CA-Scr-292/H	Prehistoric/Historic	Midden and historic foundations	Wharf Road at Perry Park, near Corridor 6
CA-Scr-293	Prehistoric	Shell midden	Bay Street at Neary's Lagoon Park, northwest of Corridor 4
P-44-406	Historic	Segments of historic Highway 1, generally constructed in the 1930s, and since abandoned	Corridors 1, 2, 5, and 6, all cross Highway 1
P-44-413	Historic	Gzsanka House ca. 1925	Adjacent to Capitola Road/ Soquel Avenue intersection, near Corridor 6
P-44-430	Historic	Abma House ca. 1920	Adjacent to Capitola Road, between Soquel Avenue and Rodeo Gulch, near Corridor 6
P-44-435	Prehistoric	Historic iron stove	Adjacent to Wharf Road, near Corridor 6

Source: NWIC 2003

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant Location

Industrial Park Area. There are no known cultural resources within the Industrial Park Area. P-44-406, part of the historic Highway 1 corridor, passes north of the Industrial Park area.

Shaffer Road/Antonelli's Pond Area. There are no known cultural resources within the Shaffer Road/Antonelli's Pond Area.

Terrace Point Area. There are no known cultural resources within the Terrace Point Area.

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1). Corridor 1 crosses the historic Highway 1 (P-44-406) at Western Avenue. As shown in Table 5.8-1, the historic Highway 1 was constructed in the 1930s and has since been abandoned. This section of the historic resource is in a state of disrepair (NWIC 2003).

There are no known cultural resources in the vicinity of the existing junction structure.

Treated Water Distribution Pipeline (Corridors 2 and 3). Corridor 2 crosses historic Highway 1 (P-44-406) at Bay Street. As described above, the historic Highway 1 was constructed in the 1930s and segments have since been abandoned.

There are no known cultural resources within Corridor 3.

Concentrate Discharge Pipeline (Corridors 1 and 4). Please see above for a discussion of potential resources for Corridor 1. CA-Scr-293 lies northwest of Corridor 4. As shown in Table 5.8-1, CA-Scr-293 consists of a shell midden.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. CA-Scr-168, CA-Scr-200, and P-44-406 are located in the vicinity of Corridor 5. CA-Scr-139, CA-Scr-171, CA-Scr-292/H, P-44-413, P-44-430, and P-44-435 are located in the vicinity of Corridor 6. CA-Scr-187 is located in the vicinity of Corridor 7. Table 5.8-1 describes the characteristics of these known resources.

5.8.3 Regulatory Framework

Cultural resources in California are protected by a number of federal, state, and local regulations, statutes, and ordinances. Management of cultural resources within the state is guided in large part by the provisions of CEQA and the National Historic Preservation Act (NHPA) of 1966. Several local initiatives also address cultural resources.

Section 106 and CEQA

Section 106 of the NHPA requires that federal agencies take into account the effects of their actions on properties that may be eligible for or listed on the National Register of Historic Places (NRHP), and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. To determine whether an undertaking could affect NRHP-eligible properties, all cultural sites that could be affected must be inventoried and evaluated for inclusion on the NRHP.

While CEQA has a much broader environmental regulatory framework than the NHPA, it also includes cultural resources as an important component. Before discretionary projects are approved, the potential for significant impacts of the project on archaeological and historical resources must be considered under CEQA (Sections 21083.2 and 21084.1) and the *CEQA Guidelines* (California Code of Regulations Section 15064.5).

Local

City of Santa Cruz

Complementing the cultural resource provisions of NEPA and CEQA are several local initiatives designed to further protect sites important to the local community. As opposed to the far-reaching perspectives of Section 106 and CEQA, community-based cultural resource preservation acts are important in that they are drafted from a local perspective and express the preservation efforts tailored to local and regional prehistory and history.

The 1990–2005 *City of Santa Cruz General Plan and Local Coastal Program* Cultural Resources Program Element built upon earlier community-based preservation efforts dating to the early 1970s. The Historic Preservation Plan (1974) and the Historic Building Surveys (1976 and 1987) performed the vital task of recording historically significant buildings and structures in Santa Cruz and eventually guided the formulation of General Plan goals and policies. The goals of the General Plan, which include the protection and proper disposition of cultural resources, are presented in Appendix B of this document.

Santa Cruz County

The Archaeological and Historic Resources section of the 1994 *County of Santa Cruz General Plan and Local Coastal Program* outlines a series of policies that enhance and support CEQA and CEQA-like statutes related to cultural resources. These policies are presented in Appendix B of this document.

City of Capitola

The *City of Capitola General Plan* outlines a series of policies that enhance and support CEQA and CEQA-like statutes related to cultural resources. These policies are provided in Appendix B of this document.

5.8.4 Impacts and Mitigation Measures

Significance Criteria

In accordance with Appendix G of the *CEQA Guidelines*, the proposed Program would result in a significant impact to cultural resources if it would:

- Cause a substantial adverse change in the significance of a unique archaeological resource or a historical resource, as defined in Section 21083.2 of CEQA and Section 15064.5 of the *CEQA Guidelines*, respectively; or
- Disturb any human remains, including those interred outside of formal cemeteries.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Subsequent expansion of the plant is not anticipated to require additional facilities outside of the 2.5-mgd plant footprint. Therefore, no additional evaluation of potential cultural resources impacts is provided for plant expansion. If additional facilities are determined necessary at the time of expansion, they would be appropriately evaluated. Table 5.8-2 summarizes potentially significant impacts.

Table 5.8-2
Summary of Potential Impacts – Cultural Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNTAIVE D-2 PUMP FACILITIES
Impact 5.8-1: Destruction or damage to known cultural resources	◐	◐	--	--	--	○	○	○	○	◐	○	○	◐	◐	◐	◐	◐
Impact 5.8-2: Destruction or damage to as-yet undiscovered/unrecorded archaeological sites	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.8-3: Destruction or damage to undiscovered/unrecorded human remains	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

Impacts and Mitigation

Impact 5.8-1: Implementation of the proposed Program could destroy or damage known cultural resources. Less than Significant for the desalination plant area (no mitigation required). Less than Significant with EIR-Identified Mitigation for the conveyance and pumping facilities.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

There are no known cultural resources within the desalination plant area. Therefore, the possibility of damage or destruction of known cultural resources would be considered less than significant.

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1). Corridor 1 crosses recorded portions of the historic Highway 1 route. The location has been recorded on Department of Parks and Recreation Site Record forms in adequate detail. The section of the Highway 1 route is in a state of disrepair, disrupting site integrity. Due to the adequate recordation and the lack of integrity of the historic resource, the proposed pipeline would not result in significant impacts to this resource.

Raw Water Intake Pumping Facility. There are no known cultural resources in the vicinity of the existing junction structure. Therefore, the possibility of damage or destruction of known cultural resources is considered less than significant.

Treated Water Distribution Pipeline (Corridors 2 and 3). Corridor 2 crosses recorded portions of the historic Highway 1 route. As described for Corridor 1, above, the possibility of damage or destruction to these cultural resources is considered less than significant.

There are no known cultural resources in the vicinity of Corridor 3. Therefore, the possibility of damage or destruction of known cultural resources is considered less than significant.

Concentrate Discharge Pipeline (Corridors 1 and 4). Please see the discussion for Corridor 1, above. Site CA-Scr-293 could be affected by construction activities along Corridor 4. The likelihood of impacts depends upon the location and depth of construction disturbances; however, the exact location of site boundaries is difficult to determine in advance of subsurface testing. This site has not been evaluated as to its eligibility for listing on the California Register of Historical Resources (CRHR) or NRHP, but it is presumed to be eligible until proven otherwise. Therefore, disturbance of these resources is considered a potentially significant impact.

Alternative D-2 (Applicable to the First Increment of both Alternatives)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Three recorded cultural resources (CA-Scr-168, CA-Scr-200, and P-44-406) could be affected by construction activities along Corridor 5. Six recorded cultural resources (CA-Sc--139, CA-Scr-171, CA-Scr-292/H, P-44-413, P-44-430, and P-44-435) could be affected by construction activities along Corridor 6. One recorded cultural resource (CA-Scr-187) could be affected by construction activities along Corridor 7.

Since these sites have not been evaluated for CRHR or NRHP eligibility , they are presumed to be eligible until proven otherwise. Therefore, disturbance of these resources is considered a potentially significant impact.

Mitigation Measures

Mitigation Measure 5.8-1: Qualified professional archaeologists shall be retained by the City to flag known sites for avoidance prior to the commencement of any construction or ground-disturbing activities. If these sites cannot be avoided, an archaeological subsurface testing program shall be implemented and data collected to make an initial assessment of CRHR and NRHP eligibility. If a site is determined to be potentially eligible for listing on either register, additional testing and mitigation may be required along the affected corridor, to be conducted prior to the onset of construction. A qualified archaeologist shall monitor all ground-disturbing activities within suspected resource sites during construction. If evidence of these sites is discovered, construction activities shall be halted and the City notified regarding the discovery. The archaeologist shall determine whether the resource is significant and develop appropriate mitigation. Any artifacts or unusual amounts of stone, bone, or shell that are uncovered during excavation and grading operations shall be recorded and removed for storage at a location to be determined by the archaeologist.

Significance After Mitigation: Less than Significant.

Impact 5.8-2: Implementation of the proposed Program could destroy or damage as-yet -undiscovered/unrecorded archaeological sites. Less than Significant with EIR-Identified Mitigation.

General Discussion

Construction of the desalination plant could affect as-yet-undiscovered or unrecorded archaeological sites. Disturbance of these resources would be a potentially significant impact.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

Although no listed archaeological sites exist within the desalination plant sites, as-yet-undiscovered or unrecorded cultural resource sites could be uncovered during Program construction activities (i.e., trenching or excavation). If such resources were significant or unique archaeological resources as defined by CEQA or NHPA, any substantial change to or destruction of these resources would be considered a significant impact.

Conveyance and Pumping Facilities

Although no listed archaeological sites exist within the conveyance facilities routes or the existing junction structure, as-yet-undiscovered or unrecorded cultural resource sites could be uncovered during Program construction activities (i.e., trenching or excavation). If such resources were significant or unique archaeological resources as defined by CEQA or NHPA, any substantial change to or destruction of these resources would be a significant impact.

Alternative D-2 (Applicable to the First Increment of both Alternatives)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Although no listed archaeological sites exist within the conveyance facilities routes or the existing junction structure, as-yet-undiscovered or unrecorded cultural resource sites could be uncovered during Program construction activities (i.e., trenching or excavation). If such resources were significant or unique archaeological resources as defined by CEQA or NHPA, any substantial change to or destruction of these resources would be a significant impact.

Mitigation Measures

Mitigation Measure 5.8-2: If unrecorded cultural resources are discovered during construction, including features, prehistoric artifacts, or unusual concentrations of bone, stone, or shell, construction activities shall be halted and the City and construction foreman shall be notified regarding the discovery. A qualified archaeologist shall be retained by the City to determine whether the resource is significant and develop appropriate mitigation.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.8-3: Implementation of the proposed Program could destroy or damage undiscovered/unrecorded human remains. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Although no human remains have been listed or recorded in the study area, they are known to occur in the study area vicinity (NWIC 2003). As-yet-undiscovered human remains could be uncovered by Program construction activities. Any disturbance of human remains would be a significant impact.

Mitigation Measures

Mitigation Measure 5.8-3: If human remains are uncovered during construction, all potentially damaging work shall be stopped, the significance of the find shall be assessed, and appropriate management shall be pursued. California law recognizes the need to protect Native American human burials, skeletal remains, and items associated with Native American burials from vandalism and inadvertent destruction. The procedures for the treatment of Native American human remains are contained in California Health and Safety Code Sections 7050.5 and 7052 and California Public Resources Code Section 5097. The responsibilities of the City for acting upon notification of a discovery of Native American human remains are identified in California Public Resources Code Section 5097.9.

In accordance with the California Health and Safety Code, if human remains are uncovered during construction at the project site, the construction contractor shall immediately halt potentially damaging excavation and notify the City or the City's designated representative. The City shall immediately notify the coroner. The California Health and Safety Code requires that if human remains are found in any location other than a dedicated cemetery, excavation is to be halted in the immediate area, and the county coroner is to be notified to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). The NAHC will contact the most likely descendent who will, in conjunction with a qualified professional archaeologist and a representative of the City, determine an appropriate course of action. Assuming the most likely descendent, the archaeologist, and the City reach an agreement regarding the disposition of the remains, the impacts to those remains will be considered to have been mitigated.

Significance After Mitigation: Less than Significant.

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5.9 PUBLIC SERVICES AND UTILITIES

5.9.1 Introduction

This section describes existing public services and utilities provided within the study area, as well as policies and regulations relevant to those services. Additionally, this section analyzes the potential impacts associated with development of the proposed Program and provides measures to reduce potential impacts.

5.9.2 Existing Conditions

Regional Setting

Public services and utilities are provided by the Cities of Santa Cruz and Capitola and by of Santa Cruz County. Table 5.9-1 identifies the public service and utility providers in the study area. A description of each service utility provider follows Table 5.9-1.

Table 5.9-1
Providers of Public Services and Utilities in the Vicinity of the Proposed Program

PUBLIC SERVICE OR UTILITY	CITY OF SANTA CRUZ	SANTA CRUZ COUNTY (LIVE OAK)	CITY OF CAPITOLA (WITHIN CITY SERVICE AREA)
Police Protection	City of Santa Cruz Police Department	Santa Cruz County Sheriff's Department	City of Capitola Police Department
Fire Protection	City of Santa Cruz Fire Department	Central Fire Protection District	Central Fire Protection District
Emergency Medical Service	Santa Cruz Consolidated Emergency Communications Center, American Medical Response West		
Wastewater Collection	City of Santa Cruz Public Works	Santa Cruz County Sanitation District (SCCSD)	
Wastewater Treatment	City of Santa Cruz Public Works		
Water	Santa Cruz Water Department		
Solid Waste	City of Santa Cruz Public Works, City of Santa Cruz Landfill	Waste Management of Santa Cruz County, Buena Vista Landfill	
Storm Drainage	City of Santa Cruz Public Works Department	Santa Cruz County Department of Public Works	City of Capitola Public Works Department, Santa Cruz County Department of Public Works
Other Utilities	SBC, Comcast, PG&E		
Schools	Santa Cruz City School District	Live Oak School District, Santa Cruz City School District	Soquel Union Elementary School District, Santa Cruz City School District
Parks and Recreation	City of Santa Cruz Parks and Recreation Department	Santa Cruz County Department of Parks, Open Space, and Cultural Services	City of Capitola Parks and Recreation Department

Police and Fire Protection

The City of Santa Cruz Police Department provides police services within the city limits and operates one police station at 155 Center Street. The Santa Cruz County Sheriff's Department provides police services throughout unincorporated Santa Cruz County and operates one station at 701 Ocean Street in the city of Santa Cruz. The City of Santa Cruz Fire Department provides fire protection services for all areas within the city limits and operates three fire stations, at 711 Center Street (Station Number 1), 1103 Soquel Avenue (Station Number 2), and 335 Younglove Avenue (Station Number 3). The fire department's average response time is 5.5 minutes within the city (Musich 2003).

The Central Fire Protection District is a special district that provides service to the Live Oak area of unincorporated Santa Cruz County (Santa Cruz County 2003). Response times vary from month to month; the most recent monthly average response time for the Central Fire Protection District is seven minutes and six seconds in October 2003 (McDougal 2003). Police services in Capitola are provided through the City Police Department. The department is located at the city hall complex, at 420 Capitola Avenue. Fire protection services for Capitola residents are provided through the Central Fire District. The majority of Capitola properties are serviced through the fire station on Capitola Avenue across from city hall. A small portion of Capitola (properties located west of 41st Avenue) is serviced through the station on 17th Avenue in Live Oak. The average response time to a call in the city of Capitola is under two minutes (City of Capitola 1989).

Emergency Medical Service

Emergency medical services within the study area are provided by the Santa Cruz Consolidated Emergency Communications Center, a joint powers authority created by, and providing public safety and 911 dispatch services for, the Santa Cruz County and the cities of Santa Cruz, Watsonville, and Capitola. Since 1990, American Medical Response West has been the sole 24-hour ambulance transport provider in the county (City of Santa Cruz 1992).

Water

The Santa Cruz Water Department (City) supplies water within the Santa Cruz city limits and portions of Santa Cruz County and the city of Capitola. A description of the service area and existing operations is provided in Chapter 4, Program Description.

Wastewater

The City of Santa Cruz Public Works Department provides wastewater collection for Santa Cruz and wastewater treatment for the entire region. The Santa Cruz County Sanitation District is a public agency providing sewage collection to unincorporated Santa Cruz County (Live Oak, Soquel, and Aptos) and the city of Capitola. Wastewater is treated at the WWTP at Neary Lagoon, owned and operated by the City of Santa Cruz. This plant treats a total of approximately 12 mgd of wastewater (Santa Cruz County 2003a). The system consists of approximately 160 miles of pipeline located in 15 drainage basins. Eight of the basins are located east of the WWTP, and the remaining seven are located west of the plant (City of Santa Cruz 1992). Treated wastewater is discharged to Monterey Bay through a deep-water outfall.

Solid Waste

The Resource Recovery and Collection Division of the City of Santa Cruz Public Works Department is responsible for solid waste disposal and recycling operations in Santa Cruz. Trash is disposed of at the City of Santa Cruz Landfill and Recycling Center at 605 Dimeo Lane, which intersects Highway 1 about three miles north of the city limits. Waste Management of Santa Cruz County is responsible for solid waste disposal and recycling operations for the Live Oak area and Capitola. Trash is disposed of at the Buena Vista Landfill west of Watsonville (Santa Cruz County 2003).

Storm Drainage

The City of Santa Cruz Public Works Department maintains storm drains within city limits. The City's Municipal Code sets standards governing the development of drainage improvements required for new construction. The City of Santa Cruz has developed a comprehensive Storm Water Management Program (SWMP) to fulfill the requirements for the Phase II NPDES General Permit for Discharges of Storm Water from Small Municipal Separate Storm Sewer Systems (General Permit) and to reduce the amount of pollutants discharged in urban runoff. The Santa Cruz County Public Works Department maintains storm drains throughout the county, including the Live Oak area. The department designs storm drain flood control projects within flood control zones, advises the public on drainage issues, resolves drainage complaints when possible, and coordinates the County's NPDES Phase II SWMP.

The City of Capitola Public Works Department maintains storm drains within the majority of the City of Capitola. The Santa Cruz County Department of Public Works maintains the storm drains in Zone 5 of the County flood control district which is within the boundaries of the city of Capitola.

Other Utilities

SBC, Comcast, and PG&E are some of the other utility providers in the study area. SBC provides telecommunication services. Comcast provides cable and internet services. PG&E provides gas and electric services.

Schools, Parks, and Recreation

The Santa Cruz City School District, a number of private schools, and an Alternative Family Education program (offered through Santa Cruz City Schools) serve the city of Santa Cruz and surrounding areas. The Live Oak School District, the Santa Cruz County Office of Education and the Santa Cruz City School District serve the Live Oak Area. The schools associated with the Live Oak School District and located in the vicinity of the study area include the following: Green Acres Elementary, Live Oak Elementary, Del Mar Elementary, and Shoreline Middle School.

The City of Santa Cruz Parks and Recreation Department maintains parks and open space within city limits. The Santa Cruz County Department of Parks, Open Space, and Cultural Services is responsible for the maintenance of parks and open space within the Live Oak area.

Education is provided to Capitola and surrounding areas by the Soquel Union Elementary School District and Santa Cruz City School District. The City of Capitola Parks and Recreation Department maintains parks and open space within city limits.

5.9.3 Regulatory Framework

State

Drinking Water Standards

The California Department of Health Services (CDHS) and USEPA set standards for contaminants in municipal water supplies. For most contaminants, the maximum contaminant levels (MCLs) set by the CDHS are more restrictive than those set by the EPA (CDHS 2003). These water quality regulations include primary and secondary drinking water standards. Primary standards are health-related and are for contaminant classes including clarity, microbiology, organic chemicals, inorganic chemicals, and radioactivity; secondary standards are set for contaminants such as iron and sulfate that affect the aesthetic quality (taste, odor, and color) of drinking water. Primary and secondary standards established by the CDHS can be found in Title 22 of the California Code of Regulations, Division 4, Chapter 15, Articles 4 (inorganic chemicals), 4.1 (fluoridation), 5 (radioactivity), 5.5 (organic chemicals), and 16 (secondary standards) and in Chapter 17.5, Article 1 (lead and copper).

The Surface Water Treatment Rule

The CDHS addresses the issue of source water quality through the Surface Water Treatment Rule (SWTR). The SWTR aims to protect the public from waterborne disease transmitted via surface water or contaminated groundwater. The SWTR prescribes a multi-barrier treatment for surface water used in a public water system to protect users from microbial contaminants. Because ocean water is considered surface water, regulations contained in the SWTR would have to be met for a desalination plant. A memorandum entitled *Protocol for Applying the Surface Water Treatment Rule to Desalination Treatment Plants* sets guidelines for seawater desalination (CDHS 1991). This memorandum states the following:

- A Watershed Sanitary Survey (WSS) of the seawater would be necessary prior to source approval.
- Coliform data on the seawater must be collected to determine appropriate treatment requirements.
- Removal credit for coliform may be granted based on demonstrated ability of the system to remove viruses and giardia cysts.
- Desalination facilities should provide a minimum of 0.5 log inactivation of giardia through disinfection.
- Conductivity of the permeate from each reverse-osmosis module should be monitored continuously to detect increases that may indicate membrane conditions allowing the passage of microorganisms.

- During operation, the source water should be monitored for microorganisms weekly at high and low tide, and product water should be monitored for conductivity, turbidity, disinfection residual, and contact time.

The purpose of a WSS is to allow CDHS to determine the overall pathogen reduction requirements for the source water and evaluate the ability of the treated process to remove any chemical contaminants. The WSS must include: (1) identification and description of all sources of actual or potential contamination affecting the intake; (2) delineation of the watershed boundaries; and (3) characterization in full of the source water quality.

Based on the results of the sanitary survey, additional treatment technologies or monitoring requirements may be mandated for the contaminants of concern. Requirements may be reduced or eliminated if it can be demonstrated that the desalination facility effectively removes such contaminants.

Local

City of Santa Cruz

The *City of Santa Cruz General Plan and Local Coastal Program*, adopted in 1992, is a comprehensive, long-term plan for physical development within the city. The Land Use Element of the General Plan sets the policy basis for change and growth within the city and identifies the general location, density, and extent of land available for housing, business, industry, natural resource protection, recreation, and other uses. The goal contained in the Land Use Element related to public services and utilities is provided in Appendix B of this document.

Santa Cruz County

The *Santa Cruz County General Plan and Local Coastal Program*, adopted in 1994, is a comprehensive, long-term planning document for the entire county. The Parks, Recreation, and Public Facilities Element of the General Plan combines numerous topics related to providing community facilities to support existing and future populations. The policy contained in the Parks, Recreation, and Public Facilities Element related to public services and facilities is provided in Appendix B of this document.

City of Capitola

The *City of Capitola General Plan*, adopted in 1989, is a blueprint for future development within the community. The Parks and Conservation Element of the General Plan includes information regarding the conservation, development, and utilization of natural resources. The policies contained in the Parks and Conservation Element related to public services and facilities are provided in Appendix B of this document.

5.9.4 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the proposed Program would have a significant adverse impact on public services or utilities under CEQA if it would:

- Disrupt utilities service to create a public health hazard or extended service disruption;
- Cause a short-term increase in demand for police and fire services during construction;
- Breach published, national, state, or local standards relating to solid waste;
- Contaminate a public water supply;
- Preclude future use of wastewater facilities;
- Increase long-term demand for public services (police, fire, wastewater, solid waste, schools, parks, etc.); or
- Interfere with emergency response plans or emergency evacuation plans.

The proposed Program would not increase the demand for public services, as it does not propose housing that would directly increase growth and subsequent demand for these services. Please see Chapter 6, Growth Inducement and Secondary Effects of Growth. In addition, the proposed Program would not interfere with emergency response plans or emergency evacuation plans.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components (i.e., desalination plant, conveyance and pumping facilities, etc.). Table 5.9-2 summarizes the level of significance for each impact.

Table 5.9-2
Summary of Potential Impacts – Public Services and Utilities

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.9-1: Damage to or interference with existing utility lines from construction activities	◐	◐	--	--	--	--	◐	○	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.9-2: Construction of the proposed Program components could potentially result in a short-term increase in demand for police and fire services if an accident should occur during construction activities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Impact 5.9-3: Result in the generation of a large volume of waste materials	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.9-4: Preclude use of existing abandoned WWTP pipeline for future emergency effluent flows	◐	◐	--	--	◐	--	--	--	--	--	--	--	--	--	--	--	--

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

Impacts and Mitigation

Impact 5.9-1: Construction activities for the proposed Program could result in damage to or interference with existing utility lines. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant Location

Industrial Park Area. Portions of the Industrial Park Area are developed. In these areas, utility lines of varying sizes are likely present. If specific locations of these utilities are not identified prior to construction, damage and temporary disruption to those lines and interruption of the associated services could result. Potential damage to major utility lines could be significant, unless appropriate coordination with other service providers is conducted during Program planning, design, and construction.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is currently undeveloped. Utility connections are unlikely to exist within the open parcel.

Terrace Point Area. Portions of the Terrace Point Area are developed. In these areas, potential impacts to utilities would be the same as for the Industrial Park Area.

Conveyance and Pumping Facilities

Numerous utility lines of varying sizes are located within public road right-of-ways along and across the pipeline corridors, as well as within the areas where pipelines would be connected. If specific locations of these utilities are not identified prior to construction, damage and temporary disruption to those lines and interruption of the associated services could result. Potential damage to major utility lines could be significant, unless appropriate coordination with other service providers is conducted during Program planning, design, and construction.

Alternative D-2 (Applicable to the First Increment of this Alternative only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Installation of D-2 pipelines could result in potential damage to or disruption of existing utilities.

Mitigation Measures

Mitigation Measure 5.9-1a: This mitigation measure applies to all proposed Program components. The City shall require the contractor to have all underground utilities and structures located in advance of excavation.

Mitigation Measure 5.9-1b: This mitigation measure applies to all proposed Program components. The City shall require the contractor to excavate around utilities, including hand excavation as necessary, to avoid damage and to minimize interference with safe operation and use.

Mitigation Measure 5.9-1c: This mitigation measure applies to all proposed Program components. The City shall coordinate its planning and design efforts with other service agencies to avoid disruption of utility lines, including wastewater, electrical, and natural gas. If relocation of utility lines is required, the City will coordinate with the appropriate service agency and determine relocation requirements prior to completion of construction of the proposed Program.

Mitigation Measure 5.9-1d: This mitigation measure applies to the pipeline components. In order to reduce potential impacts associated with utility conflicts, the following measures shall be implemented:

- Disconnected cables and lines shall be reconnected promptly.
- The City shall observe CDHS standards, which require a 10-foot horizontal separation between parallel sewer and water mains and a 1-foot vertical separation between perpendicular water and sewer line crossings.

Mitigation Measure 5.9-1e: This mitigation measure applies to all proposed Program components. The City shall require that the local fire department be contacted any time damage to a gas utility results in a leak or suspected leak or whenever damage to any utility results in a threat to public safety. In the event that separation requirements could not be maintained, the City shall obtain a CDHS variance through the use of special pipeline type or coating, or other means deemed suitable by CDHS.

Significant After Mitigation: Less than Significant.

Impact 5.9-2: Construction of the proposed Program components could potentially result in a short-term increase in demand for police and fire services if an accident should occur during construction activities. Less than Significant.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Accidents could occur in work area or along haul routes during construction activities for the proposed facilities, which would temporarily increase demand for emergency services. An increased demand would occur on an as-needed and emergency basis. This short-term increase could be accommodated by the service providers in the study area. Impairment to emergency access resulting from construction activities is evaluated in Section 5.12, Traffic and Transportation.

Mitigation Measures

None required.

⌦ **Impact 5.9-3: Construction of the proposed Program components and operation of the desalination/water treatment facility would result in the generation of solid waste that could breach existing standards and permits. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to both Alternatives)

The City of Santa Cruz landfill has approximately 6,224,882 cubic yards, or 35 years, of refuse space remaining, based on an estimated annual disposal of 107,985 cubic yards per year. The maximum daily disposal is 296 cubic yards (Chang 2004). It is estimated that, on a daily basis, the City currently uses about 40 percent of the permitted waste tonnage (Gamboa 2004). The Buena Vista Landfill has approximately 4.1 million cubic yards, or 15 to 16 years, of refuse space remaining, based on an estimated annual disposal of 245,000 cubic yards per year (671 cubic yards per day) (Matthews 2004). The Program has the potential to create solid waste through the excavation of material during construction as well as the production of sludge during the water treatment process.

The City of Santa Cruz is currently expanding or initiating new programs to increase the diversion of materials from the landfill. The state-established mandatory landfill diversion goal was 25 percent by 1995 and 50 percent by 2000. The City of Santa Cruz reached approximately 35 percent diversion to exceed the first goal in 1995. The preliminary diversion rate for 1999 is 46 percent (City of Santa Cruz 2004).

The Santa Cruz County has likely exceeded the first landfill disposal diversion milestone of 25 percent (Santa Cruz County 2004). A waste disposal study is underway to formally calculate the level of landfill diversion the community has achieved since 1990. The waste disposal study will provide the types of materials that are not being successfully recycled or diverted and recommend new programs to keep these materials out of the landfill. Implementation of Mitigation Measure 5.9-3 would ensure that the City would comply with the diversion programs and would not exceed the established standards for disposal of solid waste.

Excavation Material

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination and Conveyance Facilities. Excavation activities would be required for the desalination plant and conveyance facilities components. The estimated total volume of excavated material resulting from the proposed Program would be 110,000 cubic yards,[1] the final volume would be determined once more engineering details have been developed. It is unlikely that all the material would be off-hauled to a landfill, and disposal would occur over the course of the 34-month construction period. Assuming that 100 percent of the excavation would be disposed at landfills, it would represent 2 percent of the remaining capacity of the City of Santa Cruz landfill at Dimeo Lane, and 0.2 percent of the remaining capacity of the Buena Vista Landfill.

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1 The excavation volumes are calculated based on the following assumption for the pipeline and desalination components. Pipeline components: 15,000 feet x 6 ft x 7 feet each for the raw water pipeline, treated water pipeline, and concentrate discharge pipeline. 20,000 feet x 6 ft x 7 feet for the Alternative D-2 pipeline. Desalination plant building: 160 feet x 180 feet x 6 feet; desalination plant pretreatment facility: 60 feet x 60 feet x 6 feet.

Water Treatment Sludge

Solid waste would be created as a by-product of water treatment at the desalination facility. The following assumptions were used to determine the volume of solid waste produced by operation of the water treatment facility under the various alternatives:

- Rough sludge estimates for conventional pretreatment are on the order of 35 to 50 parts per million (ppm) by weight.
- The dry density of sludge is approximately 65 pounds/cubic foot (lb/cf).
- Treatment of sludge does not include dewatering.
- Gravitational settling achieves 0.5 percent solids removal.

Alternative D-1 (Applicable to the First Increment of this Alternative Only)

Under the first increment of Alternative D-1, it is estimated that the water treatment facility would produce between 49,000 and 56,000 cubic feet (cf) over the course of the six months of operation during a drought. These values assume that the desalination facility is operating at 2.5 mgd for half the year. During a six-month drought period, solid waste production would account for a maximum of only 0.036 percent of the remaining capacity at the Santa Cruz landfill and 0.048 percent of the remaining capacity at the Buena Vista Landfill. The daily solid waste production during the six month period of operation would account for 4 percent and 2 percent of the allowed daily disposal volumes at the Santa Cruz and Buena Vista landfills, respectively. The volumes of solid waste produced under Alternative D-1 would not violate any disposal limits or contribute greatly to the premature filling of the Santa Cruz or Buena Vista landfills.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Under the first increment of Alternative D-2, it is estimated that the water treatment facility would produce between 36,000 and 51,000 cf of solid waste per year for the first 5.5 years. Solid waste production during a six month drought period would be the same as under Alternative D-1. These values assume that the desalination facility is operating at 1.25 mgd for 5.5 years and 2.5 mgd for 0.5 years. During nondrought years, the average annual waste production would account for a maximum of 0.03 percent of the remaining capacity at the Santa Cruz landfill and 0.05 percent of the remaining capacity at the Buena Vista Landfill. During a drought year, the annual solid waste production would account for 0.05 percent of the remaining capacity at the Santa Cruz landfill and 0.07 percent of the remaining capacity at the Buena Vista Landfill. The maximum daily solid waste production during the six-month period of operation would occur during a drought and would account for 4 percent and 2 percent of the allowed daily disposal volumes at the Santa Cruz and Buena Vista landfills respectively. The first increment of the D-2 alternative also provides a contingency that the SqCWD may use up to 2.5 mgd for a short period at the onset of operation to restore groundwater levels in the Purisima aquifer. This short-term increase would not increase the maximum daily solid waste production for the first increment of Alternative D-2. The volumes of solid waste produced under the first increment of Alternative D-2 would not violate any disposal limits or contribute greatly to the premature filling of the Santa Cruz or Buena Vista landfills.

Alternative D-1 (Applicable to the Subsequent Increments of this Alternative Only)

Under the subsequent increments of Alternative D-1, it is estimated that the water treatment facility would produce from between 74,000 and 106,000 cf of solid waste for the 3.5-mgd facility, and between 95,000 and 135,000 cf for the 4.5-mgd facility over the course of the six months of operation during a drought. This represents a 40 percent increase over the first increment of Alternative D-1. However, the volumes of solid waste produced under the subsequent increments of Alternative D-1 would still not violate any disposal limits or contribute greatly to the premature filling of the Santa Cruz or Buena Vista landfills. During a six-month drought period, solid waste production from 3.5- and 4.5-mgd facilities would account for a maximum of approximately 0.06 percent and 0.08 percent of the remaining capacity at the Santa Cruz landfill and 0.10 percent and 0.12 percent of the remaining capacity at the Buena Vista Landfill. The daily solid waste production from a 3.5-mgd facility during the six-month period of operation would account for approximately 7 percent and 3 percent of the allowed daily disposal volumes at the Santa Cruz and Buena Vista landfills, respectively. Solid waste production from a 4.5-mgd facility during the same period would account for approximately 9 percent and 4 percent (4.5-mgd facility) of the allowed daily disposal volumes at the Santa Cruz and Buena Vista landfills.

Alternative D-2 (Applicable to the Subsequent Increments of this Alternative Only)

Daily solid waste production under the subsequent increments of Alternative D-2 is similar to that under the first increment of Alternative D-2. During the six months of drought, the daily solid waste production rates would be the same as those for the subsequent increments of Alternative D-1. As for the previously discussed increments, the volumes of solid waste produced under the subsequent increments of Alternative D-2 would not violate any disposal limits or contribute greatly to the premature filling of the Santa Cruz or Buena Vista landfills.

The subsequent increments of Alternative D-2 also provide a contingency that the City may decide to utilize 1.25 mgd year-round in addition to the 1.25 mgd used by the District. While daily discharge volumes would remain relatively low in such an instance, the total annual solid waste production would nearly double compared to the 1.25 year-round subsequent increment scenarios. The total volume of solid waste produced under this increment would be 13 times (1,300 percent) greater than the volume produced under the first increment of Alternative D-1. If at some point in the future the City intends to follow through with this option, additional analysis should be undertaken to ensure that the City’s landfills have enough capacity for the increase in solid waste production.

<u>Mitigation Measures</u>

Mitigation Measure 5.9-3: The City shall include in its construction specifications requirements for the contractor(s) to describe how they will recover, reuse, and recycle wastes produced during construction, demolition, and excavation activities so that all of the waste will not be disposed of at a landfill. The contractor(s) shall be required to maintain records of landfill disposal quantities.

Significant After Mitigation: Less than Significant.

Impact 5.9-4: Conversion of the abandoned WWTP pipeline and outfall would preclude its use for future emergency effluent flows. Less than Significant with EIR-Identified Mitigation.

Alternatives D-1 and D-2 (Applicable to the First and Subsequent Increments of both Alternatives)

As stated in Chapter 4, Program Description, the existing 36-inch pipeline, although abandoned, has been used within the last four years as an emergency outfall during extreme winter storms. This 36-inch pipeline is not permitted for use per NPDES Permit No. CA 0048194 (see Section 5.1, Hydrology and Water Quality). Conversion of the outfall to an intake structure would eliminate its capacity as an emergency outfall and would potentially result in overflow of existing facilities during extreme high flow events. As described in Chapter 4, Program Description, improvements to the existing wastewater conveyance facilities or pumping improvements at the WWTP would be required. Details of these improvements would be developed as engineering design progresses.

Mitigation Measures

Mitigation Measure 5.9-4: The City shall conduct further analysis to establish appropriate WWTP pumping or conveyance improvements to ensure that sufficient capacity is available within the system to accommodate wastewater flows. These improvements may include installation of additional pumps to increase pumping capacity or replacement of pipelines to reduce infiltration and inflow of stormwater runoff.

Significant After Mitigation: Less than Significant.

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5.10 VISUAL RESOURCES

5.10.1 Introduction

This section describes existing visual resources in the study area and its immediate surroundings, as well as relevant visual/scenic policies and regulations of the affected jurisdictions. The proposed desalination plant would be constructed in the city of Santa Cruz, and the proposed pipeline would be constructed in the cities of Santa Cruz and Capitola and in Santa Cruz County (the unincorporated community of Live Oak). The proposed desalination plant and associated pipelines would be located within various topographies and in areas with varying levels of visual quality.

5.10.2 Existing Conditions

Regional Setting

Neighboring land uses play a large role in defining the visual character for a specific site or area. Within the region, land uses include urban uses (residential, commercial, industrial, public facilities, and parks) as well as natural features such as hillsides and Monterey Bay. Section 5.2, Land Use, Planning, and Recreation, specifically discusses the land uses in the region and study area.

<u>Santa Cruz County</u>

Santa Cruz is the second smallest county in California, containing a total of 282,240 acres; it is located along the Central Coast area between the San Francisco Bay Area and the Monterey Peninsula (see Figure 3.1 in Chapter 3, Background). Santa Cruz County has a spectacular coastline, accessible beaches, and wooded mountains. In general, the topography allows for development on the flat western portion of the county as well as on the foothills. The mainly undeveloped mountains to the east provide a high-quality, natural backdrop for views from the west. High-quality views towards the mountains, coastline, ocean, and bay from within Santa Cruz County are available from vantage points (roadways, parks, residential areas, etc.) at varying elevations.

<u>City of Santa Cruz</u>

The city of Santa Cruz has natural areas, marine terraces, and rolling foothills. This variety of terrain provides a strong, three-dimensional character that helps to contain and define urban development by giving areas a special sense of identity and uniqueness. These features also afford a diversity of scenic backdrops and viewpoints, adding visual complexity and interest to the city. The natural features that define the scenic make-up of the city of Santa Cruz are described below.

The Monterey Bay, Pacific Ocean, and Coastline

The coastline of the Pacific Ocean constitutes the entire southern boundary and represents an important natural feature in the city’s urban setting. The coastline, shown on Figure 5.10-1, provides continuity and a strong sense of orientation and identity to the area. Beaches and coastal bike, pedestrian, and automobile routes provide highly scenic and popular places for both residents and visitors.

Figure 5.10-1 Pacific Coast, City of Santa Cruz, Looking East

Source: EDAW 2003

Bluffs and Foothills

The city of Santa Cruz has several minor ridges leading up to the foothills to the northeast. Two distinct marine terraces form ridges or bluffs that are visible from various places throughout the city. One ridge runs along Bay and California Streets and Ocean View and North Branciforte Avenues. The other ridgeline is visible from High Street traveling toward UCSC. Although farther from the city, this ridge is equally scenic. The rolling hills, seasonally changing color, and redwood forests provide a scenic backdrop visible throughout the city.

Natural areas

Natural areas in the city include Neary Lagoon, Antonelli Pond, Younger Lagoon, Arroyo Seco Canyon Creek, Pogonip Park, Moore Creek, Jessie Street Marsh, and Arana Gulch floodplain. These areas are important natural features providing scenic viewpoints and, in many places, lending their character to nearby residential neighborhoods.

San Lorenzo River

The San Lorenzo River runs north to south and divides Santa Cruz roughly in half. Because the river has historically flooded, many uses and buildings have been sited away from the river. Tall levies constructed as part of a flood control project in the 1950s isolate the river channel from the city, inhibiting views and public access to the water. Nonetheless, the San Lorenzo River represents one of the most important visual features in the city.

City of Capitola

Capitola is a small beach village located along Soquel Creek, in Santa Cruz County, on Monterey Bay. Its beachfront and riverside areas are the dominant scenic features.

Study Area Visual Character

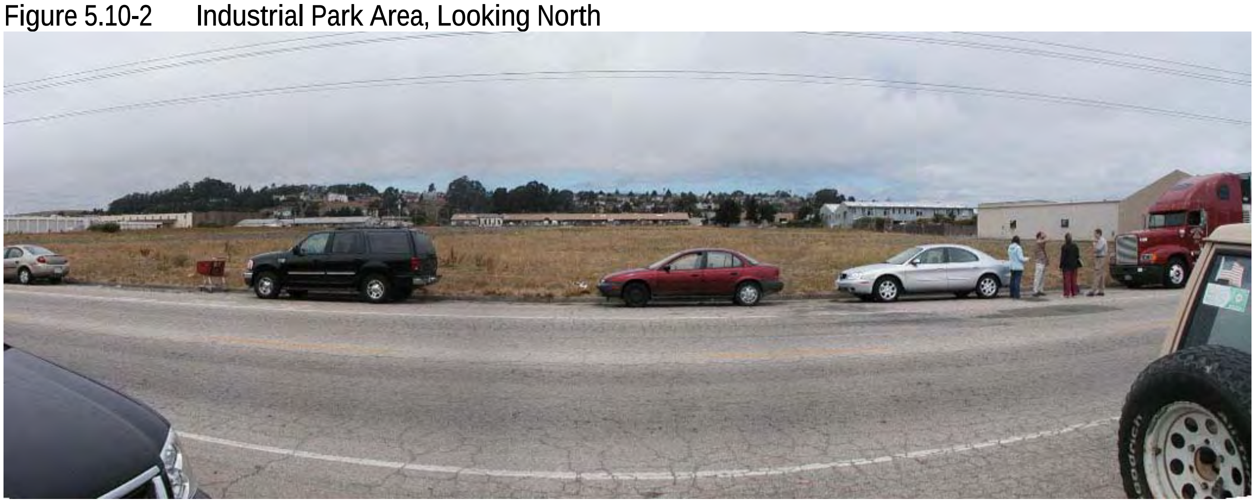
Alternative D-1 (Applicable to the First Increment of this Alternative Only)

Desalination Plant Location

The proposed desalination plant areas are generally flat and consist of unoccupied or open space areas that afford short-, medium-, and long-range views of the surrounding area.

Industrial Park Area. The Industrial Park Area is located on relatively flat ground, surrounded on all sides by other properties with an industrial appearance (see Figure 5.10-2). With the exception of the Lipton and Wrigley buildings, the entire site is unoccupied, with open ground and grassy fields extending from the SPRR south to Delaware Avenue. The northern, eastern, and western edges of the property are abutted by the backs of one- and two-story industrial buildings. The southern edge of the property is Delaware Avenue. The SPRR line borders the area to the north. Several willow bushes grow on a rise in the middle of the area, providing a break in the view across the field. Looking north from the area, the view consists of existing industrial buildings, and houses and trees on the distant marine terrace that overlooks the west side of the city. A recent restoration and realignment of Arroyo Seco Canyon Creek runs between the Lipton building and the open field. The restoration includes a 140-foot corridor landscaped with native plants, including willow and oak. The restored corridor has the potential to become a significant visual resource that could enhance the aesthetic quality of the Industrial Park Area and provide scenic, short-range views as the planted vegetation matures. Medium-range views include those looking across the open field between Delaware Avenue and the SPRR.

Figure 5.10-2 Industrial Park Area, Looking North



Source: EDAW 2003

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is located on flat to gently sloping ground bounded by Antonelli's Pond to the east, the Homeless Garden Project to the north, and Shaffer Road and the UCSC property to the west (see Figure 5.10-3). The property is covered by grasses and low herbaceous cover. A scenic beach access trail runs along the riparian corridor of Moore Creek and Antonelli's Pond on the area's eastern boundary. The tall trees and bushes associated with the pond screen the trail and pond from view. Across the pond to the east, the view provided through the gaps in the riparian vegetation consists of industrial buildings. To the north, the view contains a backdrop of rolling hills at the base of the Santa Cruz Mountains, behind a large condominium complex and the rows of crops planted in the Homeless Garden. Looking west of the area, the views are dominated by the marine terrace beyond the UCSC property. This flat, open area is covered by coastal scrub vegetation. The ocean view to the south is obstructed intermittently by tall eucalyptus trees, other vegetation, and buildings.

Figure 5.10-3 Shaffer Road/Antonelli's Pond Area, Looking North

Source: EDAW 2003

Terrace Point Area. The Terrace Point Area is the westernmost potential desalination area and retains a more rural quality than either of the other two areas. The area consists of relatively flat ground on the 60-acre Terrace Point property and the 16-acre LML property, with open space on all sides except for a small residential neighborhood on the southeast boundary (see Figure 5.10-4). The vegetation covering the area, including seasonal wetlands, coastal scrub, and grasslands, lends a natural quality to the landscape. The view to the north consists of the mixed grasslands and forests of the foothills and Santa Cruz Mountains. A small canyon that drains into Younger Lagoon separates the area from the farmlands to the west. The eastern view looks across the Shaffer Road/Antonelli's Pond Area towards the industrial buildings in the background. Tall eucalyptus trees in Natural Bridges State Park and in the foothills along Moore Creek form parts of the eastern and northern skyline visible from much of the property. Ocean views to the south are generally unobstructed, though some are blocked by buildings associated with the LML.

Figure 5.10-4 Terrace Point Area, Looking South

Source: EDAW 2003

Conveyance and Pumping Facilities

The proposed pipeline corridors are generally sited within urban roadways in predominantly residential, commercial, and industrial areas. Background views are limited due to the intervening structures in most areas, except where pipeline corridors are adjacent to the desalination area or the ocean. Foreground views include the immediate surroundings of the particular street, which may include houses, condominiums, offices, commercial areas, landscaped trees, and parks. A typical view of a residential area is shown on Figure 5.10-5.

Raw Water Intake Pipeline (Corridor 1) and Concentrate Discharge Pipeline (Corridor 4). The shared sections of Corridors 1 and 4, along Delaware Avenue and Swift Street, provide foreground views of industrial buildings and background views of the hills to the north. Corridor 1 begins on West Cliff Drive and Sunset Avenue; these roadways provide expansive southern views of the Pacific Ocean, beaches, and sea cliffs and are often used by cyclists and pedestrians. The north side of West Cliff Drive is bordered by residential buildings. Corridor 4 continues eastward along Delaware Avenue, where views are primarily of single-family homes with landscaped yards. Where Corridor 4 passes Bethany Curve Park, a medium-range view to the south is available through the understory of landscape trees. Although both corridors run along the northern border of Natural Bridges State Park and adjacent to Antonelli’s Pond, public views of the corridors are blocked by trees.

Figure 5.10-5 Typical View of a Residential Area

Source: EDAW 2003

Junction Structure. The existing junction structure is located on the beach adjacent to West Cliff Drive near Sunset Avenue (see Figure 5.10-6). Views of the site are available from the coastal biking and walking trail that runs along West Cliff Drive, as well as from adjacent homes. The structure is lower in elevation than the surrounding uses so that the view from the road is of a staircase leading down to the beach. The structure does not interfere with views of the ocean.

Treated Water Distribution Pipeline (Corridors 2 and 3). Foreground views along Corridors 2 and 3 consist mainly of industrial buildings along Delaware Avenue, shops and other commercial buildings along Mission Street, and single-family homes and trees along the streets north of Mission Street. From Delaware Avenue and Swift Street, there is a background view across the Industrial Park Area to the hills and the marine terrace to the north. Western Drive is more scenic, with the riparian corridor of Moore Creek providing natural views to the west. Along Meder Street, there is a medium-range view looking south through the grassy hills and riparian corridor in University Terrace Park. Foreground views along Bay Street consist of dense trees along Bay Creek and the sides of the road. At their western terminus, Corridors 2 and 3 pass by Antonelli's Pond and the entrance to Natural Bridges State Park. Public views of the corridors are blocked by intervening trees and shrubs in these areas.

Figure 5.10-6 Existing Junction Structure, Looking Northwest

Source: EDAW 2003

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Corridors 5 and 6 begin in a mixed residential/commercial neighborhood along Water Street and Soquel Avenue (see Figure 5.10-7). The majority of uses along Corridors 5 and 6 are commercial; however, residential uses are present in several areas. Where Soquel Avenue crosses the northern boundary of the Arana Gulch floodplain, foreground and middleground views of the creek and associated vegetation are available. Corridor 5 continues northeast, with many views of single- and multiple-family residences and open space along Soquel Avenue. Corridor 6 continues southeast along Capitola Road, with views of mostly commercial and a few residential buildings, terminating at Capitola Road and 41st Avenue. Residences along Capitola are a mixture of single-family homes and apartment complexes. Capitola Road and Soquel Avenue are intermittently landscaped with street trees and are sometimes divided by a landscaped median.

Corridor 7 runs south along Ocean Avenue and East Cliff Drive, where the corridor can be viewed from across the San Lorenzo River. The majority of buildings along Ocean Avenue are commercial, while East Cliff Drive has more residential structures. Middleground views of the Santa Cruz Harbor on Eaton Street and Twin Lakes State Beach just north of Schwann Lake provide a change to the otherwise residential landscape. Homes and trails surrounding these natural areas may provide views of the corridor alignment. The remainder of Corridor 7 runs along the railroad alignment that passes behind residential and commercial neighborhoods and a portion of 41st Avenue. This section of the corridor is obscured from public view by fences, walls, and trees.

Figure 5.10-7 Typical View of Commercial Land Uses

Source: EDAW 2003

5.10.3 Regulatory Framework

State

<u>California Coastal Act</u>

Facilities proposed within the state's coastal zone are subject to the visual resources policy of the Coastal Act:

> *Section 30251*
>
> The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

California State Scenic Highway Program

Many state highways are located in areas of outstanding natural beauty. In 1963, the California legislature created the Scenic Highway Program to preserve and protect scenic highway corridors from change that would diminish the aesthetic value of lands adjacent to highways. The state laws governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq.:

> A highway or county road may be designated scenic depending upon how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the traveler's enjoyment of the view.[2]

No highways or county roads in the study area are officially designated as scenic. However, the highways in the study area that are eligible (through the California Department of Transportation) for scenic rating include:[3]

- Highway 1: A main north-south highway east of the study area. This highway proceeds east-west just north of the study area.
- Highway 9: Extends north from Highway 1, north of downtown Santa Cruz.
- Highway 17: Extend northeast from Highway 1, immediately north of downtown Santa Cruz. This roadway is a main access route between San Jose and Santa Cruz.

Local

City of Santa Cruz

The *City of Santa Cruz General Plan and Local Coastal Program*, adopted in 1992, is a comprehensive, long-term plan for physical development within the city. The Community Design Element is concerned with how Santa Cruz looks and feels. One component of the Community Design Element is the "Natural Setting and Scenic Resources." Map CD-3 of the General Plan identifies scenic values such as viewpoints and panoramas, visually distinctive structures, scenic drives, urban skyline, ridge skyline, and foothill skyline. The Community Design Element of the *General Plan and Local Coastal Program* contains goals and policies to protect, maintain, and enhance the visual character of the city. These goals and policies are provided in Appendix B of this document.

[2] A scenic corridor is the land generally adjacent to and visible from the highway. A scenic corridor is identified using a motorist's line of vision. A reasonable boundary is selected when the view extends to the distant horizon. Jurisdictional boundaries of cities and counties are also considered.

[3] Along with highways, county roads are also eligible for the State Scenic Highway System. The same steps for nominating a county road apply to nominating a highway within the county.

Santa Cruz County

The *Santa Cruz County General Plan and Local Coastal Program*, adopted in 1994, is a comprehensive, long-term planning document for the entire county. Both the Conservation and Open Space Element and the Community Design Element of the General Plan discuss visual resources. The objectives and policies contained in the Open Space and Community Design Elements that apply to visual resources are provided in Appendix B of this document, and include provisions to protect and restore the values of visual resources.

City of Capitola

The *City of Capitola General Plan*, adopted in 1989, is a blueprint for all future development within the community. The Land Use, Open Space, and Conservation Elements of the General Plan include information regarding the protection of visual resources. The goals and policies contained in these elements that apply to the proposed Program are provided in Appendix B of this document, and include provisions to maintain and enhance the visual character of the area.

5.10.4 Impacts and Mitigation Measures

Significance Criteria

The significance criteria are based on Appendix G of the *CEQA Guidelines*. The Program would be considered to have a significant adverse impact on visual resources if it would:

- Substantially degrade the existing visual character or quality of the site and its surroundings, particularly for existing foreground views of a highly used public place (park, school, trail, etc.);
- Create a new source of light and glare, such as an introduction of reflective building materials and nightlighting into the area that would adversely affect day or nighttime views of the area;
- Substantially and adversely affect a designated scenic vista or a state scenic right-of-way; or
- Substantially and adversely affect public views.

Because the proposed facilities would not be located within a scenic right-of-way or scenic vista, or within view of an officially designated scenic roadway, no impact to scenic resources would occur due to Program implementation. The visual character of public places in the study area (e.g., parks, schools, and trails) would not be affected by Program implementation. Some views of the project area would be available from Highway 1, but views from this road would be of short duration and interrupted by vegetation. Therefore, these issue areas are not further discussed.

None of the local or regional agencies with jurisdiction over the study area have ordinances that protect residential views; therefore, changes in views from residences in the vicinity of the study area are not considered significant.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Subsequent expansion of the plant is not expected to require additional facilities outside of the 2.5-mgd plant footprint. Therefore, no evaluation of visual resources is provided for plant expansion. If additional facilities are determined to be necessary at the time of expansion, they would be appropriately evaluated. Table 5.10-1 summarizes potentially significant impacts.

Table 5.10-1
Summary of Potential Impacts – Visual Resources

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP. FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD/ ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.10-1: Construction may adversely affect visual character of adjacent land uses	◐	◐	◐	◐	○	◐	◐	◐	◐	◐	◐	◐	◐	○	○	○	○
Impact 5.10-2: Proposed Program may alter (degrade) the existing visual character of the study area	◐	◐	◐	◐	--	◐	◐	◐	◐	○	○	○	○	○	○	○	○
Impact 5.10-3: Potential for light and glare	◐	◐	◐	◐	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.10-4: Reduction of irrigation may affect visual quality of the landscape	◐	◐	◐	◐	--	--	◐	◐	◐	○	○	○	○	○	○	○	○

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

Impacts and Mitigation

⌧ **Impact 5.10-1: Implementation of the proposed Program would result in construction-related impacts on the visual character of adjacent land uses. Less than Significant with EIR-Identified Mitigation.**

<u>General Discussion (Applicable to both Alternatives)</u>

Due to the construction period associated with the proposed Program, the impact to views into the desalination site and linear corridor during construction could be significant. Construction for the proposed facilities would last from 18 to 34 months. However, to provide a conservative analysis, the duration of 34 months was used. Construction equipment would be required at the selected desalination plant site for the entire 34-month construction period. Assuming that either an existing building would be utilized to house the desalination plant, or that a new building would be the first phase of development, much of the required construction equipment could be stored out of sight. However, construction activity would be noticeable for up to 34 months, which would include the presence of construction workers, their vehicles, storage of materials and equipment, and deliveries of construction materials to and from the site. No designated scenic viewing areas would be affected at any of the proposed desalination areas. The main viewers of the construction activity would be motorists on nearby roads, employees in surrounding office buildings, or, in the case of the Shaffer Road/Antonelli's Pond Area and Terrace Point Area, the residents of De Anza Mobile Home Park.

The construction of the linear facilities would be visible to all users along the selected route. These viewers include residents, motorists, office employees, and workers at commercial facilities. The duration of linear facility construction would be much shorter than desalination plant construction, as pipeline construction would be continually progressing. Within the affected area, views of the construction activities could last for a couple of weeks. In general, the impact to visual resources associated with construction of the linear pipeline component would be less than significant because of the short duration.

There is also a potential for short-term visual impacts to become permanent visual effects if the disturbed areas surrounding the new facilities are not returned to pre-project conditions. Thus, mitigation measures would be implemented to reduce such effects.

<u>Alternatives D-1, D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant Location

Construction efforts to build the three-acre desalination plant would require large equipment (cranes, earthmovers, semi-trucks, etc.), which would be visible to the surrounding community for almost three years. The desalination plant would be built within an exterior structure (either an existing building or one built in the first phase of development), thereby reducing much of the potential adverse visual impact to a less-than-significant level. Project-level analysis would be required to determine specific mitigation measures to reduce the construction-related visual impact to a less-than-significant level.

Industrial Park Area. Construction activities for the new desalination plant would be visible to drivers on immediately adjacent roadways as well as to residents on the hill to the north (across Highway 1). There are no regulations protecting residential views in the study area; therefore, changes to these views are not considered significant. Because the area is currently vacant and undeveloped, its appearance would change substantially when the construction effort begins. The long duration of the construction could create visual impacts for motorists. To reduce the intensity of visual impacts associated with construction of a desalination facility, a new building structure could be constructed first, followed by interior construction of the individual desalination components. Thus, the most notable visual changes to the site would be associated with the presence of heavy equipment and the construction of the building structure. Following construction of the building, visible activities would be limited to parked vehicles and the storage and delivery of equipment and materials. Therefore, construction of an exterior structure would reduce the intensity of visual effects associated with construction activities.

Shaffer Road/Antonelli's Pond Area. Construction of the three-acre desalination plant at this currently undeveloped site would be visible to residents in De Anza Mobile Home Park to the south (across Delaware Street), and to residents in the recently completed three-story apartment complex to the north (across the railroad tracks). No highly used public viewing areas afford high-quality, foreground views of this site. Views from Highway 1 towards this site are primarily screened by vegetation. Because the area is vacant and undeveloped, its appearance would change substantially when the construction effort begins. The long duration of the construction could result visual impacts to the viewers described above. To reduce the intensity of visual impacts associated with construction of a desalination facility, a new building structure could be constructed first, followed by interior construction activities of desalination components. Thus, the most notable visual changes to the site would be associated with the presence of heavy equipment and the construction of the building structure. Following construction of the building, visible activities would be limited to parked vehicles and the storage and delivery of equipment and materials. Therefore, construction of an exterior structure would reduce the intensity of visual effects associated with construction activities.

Terrace Point Area. Two UCSC building complexes on the southern portion of the Terrace Point area are the only built features on the site. Construction of the desalination plant at the generally flat expansive, undeveloped area location would be visible to residents of De Anza Mobile Home Park to the east, residents on the hill to the northeast, and residents in the three-story apartments to the northeast. As there are no regulations protecting residential views in the vicinity of the study area, impacts to residential views are considered less than significant. The two-story Raytek office building is next to the northernmost Terrace Point development location, just across the railroad tracks, and employees within this building would have a foreground view of the construction activities. Because the area is generally undeveloped, its appearance would change substantially when the construction effort begins. The long duration of the construction could result visual impacts to the viewers described above. To reduce the intensity of visual impacts associated with construction of a desalination facility, a new building structure could be constructed first, followed by interior construction activities of desalination components. Thus, the most notable visual changes to the site would be associated with the presence of heavy equipment and the construction of the building structure. Following construction of the building structure, visible activities would be limited to parked vehicles and the storage and delivery of equipment and materials. The construction effort at the Terrace Point Area could be distracting for those who now have a relatively unobstructed view of the coastline. However, the presence of a building would reduce the intensity of visual effects associated with construction activities of the individual desalination components.

Conveyance and Pumping Facilities

During the construction phase, trenching activities would be visible mainly to people in the immediate vicinity, including motorists, residents, and/or office employees where commercial uses are present. In addition, the open trench, construction-related equipment would be visible along the linear corridor. The construction train would continually progress over the 34-month construction period, thereby shifting the viewshed area. Therefore, construction-related visual effects are considered less than significant. The construction effort required for the pumping facility could affect the visual character of a site, but due to its limited size, the facility is not expected to result in significant visual impacts.

Raw Water Intake Pumping Facility

Construction of the pumping facility within or adjacent to the junction structure would generally be visible to those in the immediate area. These viewers include residents to the south, motorists on nearby roadways, and pedestrians along West Cliff Drive. Pedestrian views are mainly available immediately north of the existing junction structure from a highly used walking path (along West Cliff Drive). A portion of the construction effort would occur below the cliff (on the beach level) and would be visible only for a brief duration. Once a final site is identified for the pump station, additional project-level visual analysis would be completed to determine construction impacts on any publicly accessible foreground views in the vicinity.

Raw Water Intake, Treated Water Distribution, and Concentrate Discharge Pipelines

Construction activities (including machinery, the crew, and the open trench) would be noticeable to people in the immediate vicinity of the trenching. As described above, trenching activities would be continually moving; thus, impacts would be temporary in nature and considered less than significant.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. The visual environmental would be affected by construction of the pipelines and pumping station. As changes in foreground views of the affected areas would be temporary in nature, potential effects would be considered less than significant.

Mitigation Measures

Mitigation Measure 5.10-1a: This mitigation measure applies to the desalination plant only. The desalination plant shall be constructed in an existing building or inside a new building constructed in the first phase of development to reduce the construction-related visual impact on surrounding receptors. Use of a building (new or existing) to contain the proposed facilities would reduce the length and intensity of desalination plant construction activities visible to surrounding viewers. Once a final site and design have been selected, project-level visual analysis shall be performed to determine if additional mitigation measures are needed.

Mitigation Measure 5.10-1b: This mitigation measure applies to all proposed Program components. Construction-related activities shall be confined to the designated right-of-way and to the area approved for the desalination plant. To the extent feasible, all disturbed areas (e.g., roadway trenches and staging areas) shall be returned to their preconstruction condition. Any vegetation removed would be replaced (at a ratio dependent on site-specific conditions) to retain the quality of the viewshed that existed prior to construction.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.10-2: The addition of new facilities associated with the proposed Program could alter (degrade) the existing visual character. Less than Significant with EIR-Identified Mitigation.**

General Discussion (Applicable to both Alternatives)

Addition of a new three-acre desalination plant into an otherwise static visual environment could degrade the quality of the existing viewshed. Additional project-level visual analysis would be conducted once a site is selected and the plant design is finalized. Site-specific visual simulations would be performed to determine potential visual impacts to the site and surrounding area. All of the potential desalination areas contain existing development; therefore, it is assumed that the addition of a desalination plant with vegetative screening and/or architectural treatment would not significantly degrade views.

All pipelines associated with this Program would be buried underground. Therefore, the only visual impacts associated with the linear facilities would occur during the construction phase (see Impact 5.10-1), and no long-term visual impacts would result. To ensure that short-term visual effects of construction activities do not become permanent effects, Mitigation Measure 5.10-1b, restoration of disturbed areas to preconstruction conditions, would be implemented.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant Location

A new three-acre desalination plant would introduce an industrial facility either into an undeveloped area surrounded by substantial industrial development (Industrial Park Area), or into an undeveloped area surrounded by minor amounts of commercial or university-related buildings (Shaffer Road/Antonelli's Pond and Terrace Point Areas). The industrial nature of the desalination plant could be mitigated by enclosing the facility in a building, implementing City-approved architectural treatment, installing vegetative screening, and utilizing varying topographical elevations. Once a final design and site have been determined for the desalination plant, additional project-level visual analysis would be conducted to identify impacts on the visual character of the viewshed and specific mitigation measures to reduce the impacts.

Industrial Park Area. Due to the existing industrial surroundings, the addition of an aesthetically similar facility would not change the visual character of the area. High-quality views of this site are available from residences on the hill to the north, from Delaware Avenue, and from adjacent industrial facilities; however, because these views and viewpoints are not considered significant public resources and the local jurisdictions do not have ordinances protecting residences, a less-than-significant visual impact would result.

Shaffer Road/Antonelli's Pond Area. Views are expansive across this site because there are no intervening buildings on this parcel. While an industrial building is located immediately east of Antonelli's Pond, the visual character of this site is more heavily influenced by UCSC land to the west, which is mainly open space. The northernmost residents in De Anza Mobile Home Park to the south would have an immediate foreground view of this parcel, and the addition of a three-acre desalination plant would alter the visual character. However, this area is viewed by only a few residents, and man-made features are present in the foreground. Therefore, the quality of the viewshed would not be substantially degraded, and the impact would not be significant. Other viewsheds that would be altered at this area include those visible from the entrance to the UCSC campus at Delaware Avenue, from the residences on the hill to the northeast, and from a very short segment of east-bound Highway 1 (just northwest of the study area). Because these views and viewpoints are not considered significant public resources and the quality of the viewshed would not be significantly degraded, the resulting impact would be less than significant with the implementation of Mitigation Measure 5.10-2a.

Terrace Point Area. Views across this area are currently unobstructed, as the site is undeveloped; however, views are influenced by two large buildings to the south and west. The visual character of this site is dominated by open space, although development is visible. Due to the flat topography of this site, the desalination plant would be visible to surrounding viewers. Siting the plant in this area would affect generally the same viewers as the Shaffer Road/Antonelli's Pond site, as described above (De Anza Mobile Home Park is located to the east/northeast), and similar visual impacts would result from the addition of the desalination facility. Viewsheds that would be altered from siting of a desalination facility would include those from the residences on the hill to the northeast, residents in the three-story apartments to the northeast, and employees within the two-story Raytek office building north of Terrace Point. Because these views and viewpoints are not considered significant public resources and the quality of the viewshed would not be significantly degraded, the resulting impact would be less than significant with the implementation of Mitigation Measure 5.10-2a.

Conveyance and Pumping Facilities

The visual character of all linear corridors is similar and mainly defined by residential, commercial, and industrial land uses. As the proposed pipeline facilities would be located beneath grade, no significant long-term visual impacts would result. The proposed pump station would be located within or adjacent to the existing junction structure, below the elevation of the coastal bluff. As the facility would either be enclosed or clustered with an existing facility of a similar design, potential visual impacts would be considered less than significant. No mitigation measures are required.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. As the proposed pipeline facilities would be located beneath grade upon completion, no significant long-term visual impacts would result. The location of the D-2 pumping facility has not yet been selected, although it could be located within a variety of land uses. Potential visual impacts of the D-2 pumping facility would depend on the siting and appearance of the facility. Impacts to visual resources would be less than significant with Mitigation Measure 5.10-2c.

<u>Mitigation Measures</u>

Mitigation Measure 5.10-2a: The City shall enclose the desalination facility in either a newly constructed building that is similar in design to surrounding facilities or in an existing industrial building. The City shall utilize architectural and vegetative treatment in the final design of the desalination facility to ensure that the visual quality of the site and surroundings is maintained. Vegetative screening shall be installed in the first phase of project construction to create the highest level of visual screening from construction and operation of the proposed Program at the earliest feasible date. Once a final site and design have been selected, project-level visual analysis shall be required to determine if additional mitigation measures are needed.

Mitigation Measure 5.10-2b: This mitigation measure applies to the desalination component, particularly for the Shaffer Road/Antonelli's Pond and Terrace Point Areas. The City of Santa Cruz shall ensure that there is a buffer of open space between the desalination facility and any roadway or residential development. Specific setbacks shall be determined once a final design and site have been selected for the proposed desalination facility.

Mitigation Measure 5.10-2c: The City shall locate or design the proposed D-2 pumping facility such that it would not degrade the visual environment. The City shall utilize vegetative and/or architectural treatment in the final design of the desalination facility to ensure that the visual quality of the site and surroundings is maintained. Once a final site and design have been selected, project-level visual analysis shall be required to determine if additional mitigation measures are needed.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.10-3: Construction and operation of proposed Program facilities could increase light and glare from in the study area. Less than Significant with EIR-Identified Mitigation.**

<u>General Discussion (Applicable to both Alternatives)</u>

The new three-acre desalination plant could potentially represent a highly illuminated facility that stands out from its surroundings. In addition, linear construction activities would require substantial lighting.

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant Location

The desalination plant would require considerable lighting. By utilizing solid walls with light-absorbing materials, the plant could avoid dispersing light into the surrounding land uses. Construction and operational lighting would not be as noticeable at the Industrial Park Area as it would be at the Shaffer Road/Antonelli's Pond and Terrace Point Areas because there is less development in the vicinity of these areas. The exact lighting requirements would be determined once a final design for the desalination facility has been completed.

Industrial Park Area. With well-lit roads and existing industrial buildings in the surrounding parcels, a new structure in the Industrial Park Area would not attract considerable visual attention. Efforts should be made to site the new desalination facility nearer to the neighboring parcels and to incorporate similar industrial lighting as that currently exists. The additional light generated by the new facility would be visible to all those who could view this parcel. Because of the size and industrial nature of the proposed facility, a significant change in current lighting conditions could result. Additional project-level visual analysis would be performed once a final site and design have been selected. Nighttime visual simulations would also be required.

Shaffer Road/Antonelli's Pond Area. Aside from the minimal development surrounding this site, there are no other nearby sources of light that influence the nighttime visual character of this area. To the extent feasible, the final design of the desalination plant would ensure that the nighttime visual character of this undeveloped site is retained. Additional project-level visual analysis would be performed once a specific lighting plan is developed, and mitigation measures could be necessary to ensure a less-than-significant impact.

Terrace Point Area. Proposed Program construction and operation would have the same effects on nighttime visual conditions at this area as at the Shaffer Road/Antonelli's Pond Area, as discussed above.

Conveyance and Pumping Facilities

No operational lighting would be required for the conveyance or pumping facilities. Construction lighting would be needed, but requiring that all lighting be shielded and directed downward would mitigate the impact to a less-than-significant level.

Alternative D-2 (Applicable to the First Increment of both Alternatives)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. No operational lighting would be required for the conveyance or pumping facilities. Construction lighting would be needed, but requiring that all lighting be shielded and directed downward would mitigate the impact to a less-than-significant level.

Mitigation Measures

Mitigation Measure 5.10-3a: This mitigation measure applies to all proposed Program components. Additional project-level visual analysis shall be conducted once a final site and design have been selected. Nighttime visual simulations shall be required. During the operational phase, the City shall require directional or shielded lighting, where possible, only areas required to be lit for security purposes would be constantly lit during night hours. Installation of "on/off" switches on all nighttime lighting fixtures that are not constantly needed for security purposes shall be required. All new structures shall be built with nonreflective paints, so as to avoid any unnecessary nighttime glare. Structures shall be designed to avoid reflection or glare into the traffic on surrounding roadways or residential areas (e.g., no mirrored windows). "Spot-lighting" shall only be used when directed at the base portion (below 5 feet in height) of new buildings or infrastructure. Vegetative screening shall be planted around the desalination facility site to avoid the dispersion of light onto neighboring parcels.

Mitigation Measure 5.10-3b: This mitigation measure applies to all proposed Program components. Construction lighting is considered a short-term, less-than-significant impact; however, any lighting that is required for the construction (either of the desalination plant or the linear facilities) shall be directional and/or shielded lighting.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.10-4: Mandatory curtailment during droughts associated with the proposed Program would reduce outdoor irrigation, which could affect the visual quality of the environment due to the lack of landscape watering. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to both Alternatives and all Increments)

Implementation of curtailment during droughts could result in physical changes to the landscaped environment, including a reduction in visual quality from the loss of landscaped plants. In general, landscaped plants are not special-status plants and do not support special-status wildlife species. Gary Fiske & Associates (2001) evaluated the impacts on landscaping associated with three levels of outdoor water curtailments, but did not evaluate the extent to which curtailment would exacerbate the loss of landscape value.[4] The three levels of outdoor curtailment examined in the report were 30, 65, and 100 percent (Gary Fiske & Associates 2001). For the purposes of this EIR analysis, a review of the impacts for 30 to 65 percent curtailment is presented to assess potential impacts from a 15 percent curtailment (a peak system shortage of 10 to 20 percent corresponds with a shortage of 30 to 50 percent for irrigation). Tables 5.10-2 and 5.10-3 show the percentage loss associated with specified outdoor curtailment. Landscape impacts on commercial and industrial landscapes were visually assessed during drive-through tours and were not quantitatively surveyed.

Table 5.10-2
Summary of Large Landscape Areas and Impact of Outdoor Curtailment

TYPE OF LANDSCAPE	AREA OF LANDSCAPING (PERCENT OF AREA)[1]	30% OUTDOOR CURTAILMENT	65% OUTDOOR CURTAILMENT
Golf Course: De Laveaga	Turf 90 Trees 5 Shrubs 1	30 20 0	65 40 0
Parks Winkle Farm Park	Turf 90 Trees 10 Shrubs 0	30 10 0	60 30 0
De Laveaga Park	Turf 50[2] Trees 50[2]	--	--

Notes:

1 *These figures represent the relative area of the large landscape covered with the identified type of landscape component rather than a physical measurement of square foot area.*

2 *These relative areas for turf and trees are rough estimates; a more accurate estimate could be developed with the use of an aerial photo, which was not available for the study.*

-- = Not applicable

Source: Gary Fiske &Associates 2001

4 Barrie Coate Associates prepared a report on landscape impacts as part of the *Santa Cruz Water Department Water Curtailment Study, Final Report*.

Table 5.10-3
Summary of Residential Landscape Areas and Impact of Outdoor Curtailment

CENSUS TRACT [1]	TYPICAL LANDSCAPE (AVERAGE AREA, SF) [2]		30% OUTDOOR CURTAILMENT (AVERAGE PERCENT LOSS IN VALUE)	65% OUTDOOR CURTAILMENT (AVERAGE PERCENT LOSS IN VALUE)
1001	Turf	783	30	70
	Trees	19	12	45
	Shrubs	420	8	23
	Intensive	250	32	68
1002	Turf	667	16	54
	Trees	3	11	34
	Shrubs	327	7	29
	Intensive	130	28	83
1213	Turf	700	20	41
	Trees	3	10	26
	Shrubs	717	8	28
	Intensive	100	10	55
1215	Turf	700	12	34
	Trees	2	2	9
	Shrubs	1,333	2	19
	Intensive	100	20	50
1006	Turf	1,700	24	52
	Trees	7	5	20
	Shrubs	1,967	4	18
	Intensive	700	16	38
1005	Turf	1,633	22	51
	Trees	2	0	0
	Shrubs	717	7	32
	Intensive	383	36	58
Average all Census Tracts	Turf	1,030	21	50
	Trees	6	7	22
	Shrubs	919	6	25
	Intensive	277	24	59

Notes:

1 *Census tracts were used in the study to subdivide the city into units that could be intensively surveyed. These tracts were chosen to represent the full range of housing and landscaping commonly found in Santa Cruz.*

2 *See the original Barrie Coate and Associates study for the range of value loss). The estimates of loss in this analysis do not in most cases denote entire loss, in the short term, of landscape plants, but partial loss of their aesthetic value. Loss of aesthetic value influences real estate values, commercial values of businesses, and both market and non-market recreational values.*

SF = square feet

Source: Gary Fiske &Associates 2001

Large Landscape

Table 5.10-2 shows the percentage loss of value to parks and golf courses associated with the two outdoor curtailment levels. Indigenous tree species at De Laveaga Park are not expected to suffer significantly in the absence of irrigation. Trees planted at the golf course would suffer to various degrees depending on the species and the length of the curtailment. For example, Monterey pine trees would be susceptible to beetle infestation if irrigation at the perimeter of the golf course is cut off.

Residential

As shown in Table 5.10-3, under the 30 percent outdoor curtailment scenario, relatively modest losses of value would occur for residential customers (Gary Fiske & Associates 2001). The overall impact of a 30 percent mandatory reduction in irrigation water would be relatively minor, although the impact would be concentrated in intensively gardened areas and turf (24 and 21 percent loss of value, respectively). Under the 65 percent outdoor curtailment level, losses would average 50 to 59 percent for turf and intensively gardened areas, whereas shrubs and trees would suffer 25 percent and 22 percent loss of value. Residents would find it difficult to maintain valuable landscapes, even if a triage approach of watering only the most vulnerable or valuable portions of their gardens were implemented. It should be noted that a 65 percent outdoor curtailment level is much higher than that associated with a 15 percent overall curtailment (< 50 percent outdoor curtailment). It is not likely that such extreme losses in value would occur.

Commercial/Industrial

Gary Fiske & Associates did not conduct a quantitative analysis of the loss of value associated with each outdoor curtailment level. Landscape trees would be affected to varying degrees, depending on the amount of irrigation available and the type of species.

Desalination Plant

The addition of a three-acre desalination plant has the potential to alter and degrade the existing visual condition of the site where it is located. As noted in Mitigation Measures 5.10-2a, vegetative screening would be utilized to reduce the visual presence of the new desalination plant. Once a final design has been approved by the City, a project-level visual analysis would be performed on the proposed landscaping plan.

Summary

Gary Fiske & Associates evaluated landscape types in the surveyed areas and associated impacts from water curtailment. In some cases, the partial loss of aesthetic value may be easily recoverable if some or all of the accustomed water supply is reapplied. However, some vegetation, such as the Monterey pine trees, may suffer from beetle infestation during drought stress. Other tree species susceptible to beetle infestation in the absence of irrigation include a variety of gum trees. When trees are killed by bark beetles, it takes two to five years before they are so hazardous that they must be removed. Native trees and drought-tolerant exotic species, however, would benefit from a reduction in irrigation. However, if individual specimens have become habituated to irrigation over a long period, they could exhibit severe stress symptoms or death if sudden, complete removal of irrigation were to occur in spring. Based on the assessment by Gary Fiske & Associates, turf in many locations is overwatered; in areas where nitrogen is already depleted, a reduction in aesthetic value may not be as noticeable as in more frequently fertilized or less frequently irrigated turf in clay soils. With respect to shrubs, generally young landscapes are entirely dependent on regular, frequent irrigation and would suffer if 65 percent of irrigation water is not available. Landscapes with established root systems may suffer little effect from reduced irrigation, except for specific species.

Water curtailment would occur during peak periods of drought years, when landscapes are already under stress due to the less-than-normal rainfall. Soils that normally recharge with moisture during fall, winter, and spring rainfall would be drier during a drought, leading to potential declines in landscape vigor and increased susceptibility to pests and pathogens. The impacts of a drought may compound the impacts of water curtailment, potentially increasing the severity of landscape value loss shown in Table 5.10-3.

The frequency of droughts cannot be predicted. It is unlikely that any loss of value to landscapes from a 15 percent curtailment would be sustained for long periods of time, and potential losses in value would likely be recoverable. Based on surveys of customers, the *Water Curtailment Study* related Santa Cruz residential customers' responses to curtailment levels and concluded that they could tolerate systemwide shortages of between 10 and 20 percent.

In accordance with *CEQA Guidelines* Section 15064(e), "economic and social effects of a physical change may be used to determine that the physical change is a significant effect on the environment. If the physical change causes adverse economic or social effects on people, those adverse effects may be used as a factor in determining whether the physical change is significant." As such, a loss of aesthetic value could be tolerated for a 20 percent curtailment level, and potential impacts would therefore be considered less than significant.

REFERENCES

California Coastal Act. January 2003. *Public Resources Code Division 20*.

City of Capitola. 1989. *City of Capitola General Plan*.

City of Santa Cruz. 1992. *City of Santa Cruz General Plan and Local Coastal Program*. Amended October 1994.

County of Santa Cruz. 1994. *Santa Cruz County General Plan and Local Coastal Program*.

California State Scenic Highway Program. URL = http://www.dot.ca.gov/hq/LandArch/scenic_highways/index.htm. Website accessed January 2004.

Gary Fiske & Associates. February 2001. *Water Curtailment Study Final Report*.

5.11 HAZARDS AND HAZARDOUS MATERIALS

5.11.1 Introduction

This section discusses existing conditions in the study area, including the status of potential public health and environmental issues related to soil and groundwater contamination. The analysis contained in this section is based upon a regulatory database search performed by Environmental Data Resources, Inc. (EDR) in September 2003. In addition, this section presents an evaluation of the potential impacts associated with hazards and hazardous materials that would result from Program implementation and mitigation measures to reduce impacts.

5.11.2 Existing Conditions

Known Contamination Sites

EDR conducted a regulatory database search for a one-mile radius generally surrounding the potential desalination plant areas. A study was not conducted exclusively for the conveyance facilities along the proposed pipeline corridors; however, information about hazardous sites was available for corridors adjacent to the proposed desalination areas. The regulatory database search report included a list of sites adjacent to and in the vicinity of the proposed desalination plant areas that had documented use, generation, storage, or releases of hazardous materials or petroleum products. The database also included regulatory agency lists of known or potential hazardous waste sites, landfills, hazardous waste generators, and disposal facilities, in addition to sites under investigation. The information provided in the EDR database search was obtained from publicly available sources. Those databases included but are not limited to the following:

- Cortese List: Governor’s Office of Planning and Research
- Leaking Underground Storage Tanks: Regional Water Quality Control Board (RWQCB)
- Comprehensive Environmental Response Compensation and Liability Information System: USEPA Superfund sites
- National Priority List: USEPA Priority Superfund sites
- Annual Work Plan: California Environmental Protection Agency (CalEPA)

Study Area

<u>Alternatives D-1 and D-2 (Applicable to both Alternatives)</u>

Desalination Plant Location

Some amount of contamination is expected within commercial, industrial, and urban areas. All three of the potential desalination plant locations are within one-quarter mile of businesses known to use, generate, and/or store hazardous materials. One incident of a hazardous material release occurred, as discussed below.

Industrial Park Area. Within the Industrial Park Area, Lipton, Inc. (at 2200 Delaware Avenue) was identified as being on the Cortese List, which primarily documents release incidents from underground storage tanks. Further investigation revealed that in 1989, a structural failure caused an underground storage tank to leak a petroleum-based substance, affecting groundwater in the area. However, the site was properly remediated and the tank was removed. The case was closed by the Central Coast RWQCB on March 19, 1997, and by the Santa Cruz County Department of Environmental Health on October 21, 1997 (County of Santa Cruz Department of Environmental Health 2003). According to the EDR report, the Wrigley property contains an inactive underground storage tank, and the Lipton property contains an aboveground storage tank, the status of which is not known.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area was not identified on state or federal lists as the location of a known hazardous material release; a location where hazardous materials are currently used, generated, or stored; or as the location of underground tanks. The businesses in the area surrounding the Shaffer Road/Antonelli's Pond Area are known to use, generate and/or store hazardous materials, as is typical in an industrial, urban environment. The site closest to the Shaffer Road/Antonelli's Pond Area where hazardous materials are either used, generated, or stored is at 2300 Delaware Avenue (Texas Instruments Inc.,[2] and AT&T Technologies occupy the site).

Terrace Point Area. The Terrace Point Area was not identified on state or federal lists as the location of a known hazardous material release; a location where hazardous materials are currently used, generated, or stored; or as the location of underground tanks. The businesses in the area east of the Terrace Point Area are known to currently use, generate, and/or store hazardous materials, as is typical in an industrial, urban environment. The closest site to the Terrace Point Area that either uses, generates, or stores hazardous materials is the UCSC property at 100 Shaffer Road.

Conveyance Facilities

Raw Water Intake Pipeline (Corridor 1), Treated Water Distribution Pipeline (Corridor 2), Treated Water Distribution Pipeline (Corridor 3), Concentrate Discharge Pipeline (Corridors 1 and 4)

As previously mentioned, a database search was not conducted exclusively for the conveyance facilities; however, information about hazardous sites along portions of Corridors 1, 2, 3, and 4 was obtained from the database search for the desalination plant areas. The regulatory database search showed that a few businesses in the industrial areas of the pipeline corridors are known to use, generate, and/or store hazardous materials, as is typical in an industrial, urban environment. According to the database search, no major incidences of hazardous material spills or contamination have been reported from these uses.

Junction Structure. A study was not conducted exclusively for the existing junction structure; however, information about hazardous sites in the vicinity of the appurtenances was obtained from the database search for the potential desalination plant locations. The regulatory database search showed that a few businesses in the industrial areas of the pipeline corridors are known to use, generate, and/or store hazardous materials, as is typical in an industrial, urban environment. According to the database search, no major incidences of hazardous material spills or contamination have been reported.

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[2] The Texas Instruments plant has since been closed and is no longer generating hazardous materials.

Alternative D-2 (Applicable to this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7)

Pipeline Corridors 5, 6, and 7 are located within residential and commercial uses that may include gas stations and dry cleaners. Although a database search for hazardous materials was not conducted for these corridors, it is assumed that some amount of contamination may exist.

5.11.3 Regulatory Framework

Hazardous substances are extensively regulated by federal, state, regional, and local regulations, with the major objective of protecting public health and the environment. In general, these regulations provide definitions of hazardous substances, establish reporting requirements, require health and safety provisions for both workers and the public, and set guidelines for the handling, storage, transport, remediation, and disposal of hazardous wastes. Regulatory agencies also maintain lists or databases of sites that are classified as hazardous waste generators or that store hazardous substances in underground storage tanks, as well as sites where soil or groundwater quality may have been affected by hazardous substances.

Federal

The U.S. Department of Transportation (DOT) Office of Hazardous Materials Safety regulates the transportation of hazardous materials and enforces guidelines created to protect human health and the environment through the creation of hazardous material packaging and transportation requirements. The DOT provides hazardous materials safety training programs and supervises hazardous materials activities. The DOT also develops and recommends regulations governing the multimodal transportation of hazardous materials.

State

The California Environmental Protection Agency (Cal EPA), Department of Toxics Substances Control (DTSC), regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. In Santa Cruz County, remediation of contaminated sites is performed under the oversight of the Cal EPA and with the cooperation of the Santa Cruz County Department of Environmental Health. The Central Coast RWQCB would also be involved in remediation if groundwater is affected.

Storage of hazardous materials in underground storage tanks is regulated by the State Water Resources Control Board, which has overall responsibility for implementing regulations set forth in Title 23 of the California Code of Regulations. State standards cover the installation and monitoring of new tanks, the monitoring of existing tanks, and corrective actions for removed tanks. State underground storage tank regulations, including permitting for all hazardous materials storage, are enforced by the Santa Cruz County Department of Environmental Health.

Local

<u>City of Santa Cruz</u>

The City of Santa Cruz's hazardous materials ordinance regulates and enforces the proper storage and handling of hazardous materials. The City's Fire Department works in conjunction with the Santa Cruz County Department of Environmental Health in responding to reports of hazardous materials spills and accidents and enforcing hazardous materials regulations. In addition, the *City of Santa Cruz General Plan and Local Coastal Program* provides goals and policies concerning hazardous materials. These are identified in Appendix B of this document.

<u>County of Santa Cruz</u>

The Santa Cruz County Department of Environmental Health is the primary agency responsible for the management of hazardous materials and wastes in Santa Cruz County. The department is responsible for hazardous waste generator inspections, underground storage tank regulation and removal, emergency response, and hazardous site cleanup.

Businesses and individuals using hazardous materials or generating hazardous waste are required by the County of Santa Cruz to file with the Santa Cruz County Hazardous Waste Management Program (CHWMP). In order to protect human safety, health, and the environment, the County Health Officer is authorized to obtain information from anyone generating hazardous materials. The Hazardous Waste Management section of the Safety Element of the *Santa Cruz County General Plan* summarizes facility siting provisions of the CHWMP required by state law. In accordance with Chapter 7.100 of the Santa Cruz County Code, a business using hazardous materials is required to obtain a permit and prepare a Hazardous Materials Management Plan.

<u>City of Capitola</u>

The City of Capitola hazardous materials ordinance requires that the City be notified of all use, storage, and transport of hazardous materials. The City also cooperates with Santa Cruz County and the Central Fire District in responding to emergency hazardous material spills. Under the first response system, Central Fire District personnel would respond to a hazardous material spill in Capitola.

5.11.4 Impacts and Mitigation Measures

Significance Criteria

According to Appendix G of the *CEQA Guidelines*, a substantial impact related to hazardous materials would occur if the Program would:

- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;

- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; or
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.

The proposed desalination plant sites are not included on any list of hazardous material sites compiled pursuant to Government Code Section 65962.5. Therefore, the proposed Program would not create a significant hazard to the public or the environment. No further discussion of this criterion is provided.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Evaluation of subsequent plant expansion is also provided where relevant. Table 5.11-1 summarizes potentially significant impacts.

Table 5.11-1
Summary of Potential Impacts – Hazardous Materials

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIE D-2 PUMP FACILITIES
Impact 5.11-1: Accidental construction-related hazardous releases affecting human health and the environment	◐	◐	◐	◐	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.11-2: Construction-related disturbance of existing contaminated soils and/or groundwater	◐	◐	◐	◐	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.11-3: Accidental release of hazardous materials from Program operation and the potential to affect human health and the environment	◐	◐	◐	◐	--	--	◐	◐	◐	--	--	--	--	--	--	--	--

Source: EDAW 2003

Notes: – = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]*Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.*

[2]*Impacts associated with the specific facilities of the desalination plant.*

Impacts and Mitigation

⌧ **Impact 5.11-1: Program component construction activities could expose workers, the public, and waterbodies to hazardous materials and/or wastes as a result of an accidental spill of oil, grease, fuel, or other hazardous materials. Less than Significant with EIR-Identified Mitigation.**

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Construction activities throughout the study area would require the use of certain potentially hazardous materials such as fuels, oils, solvents, lead solder, and glues. These materials would generally be used for excavation equipment, generators, and other construction equipment and would be contained within vessels engineered for safe storage. These materials could be stored at the construction site.

Where construction activities are adjacent to a waterway, accidental release of hazardous materials could degrade water quality. This potential impact could be readily mitigated with implementation of appropriate plans and procedures, such as the required stormwater pollution prevention plan and spill prevention procedures (see also Section 5.1, Hydrology and Water Quality).

<u>Mitigation Measures</u>

Mitigation Measure 5.11-1a: This mitigation measure applies to all proposed Program components. The City shall incorporate into contract specifications the requirement that the contractor(s) enforce strict on-site handling rules to keep hazardous materials out of receiving waters associated with construction activities from being exposed and out of receiving waters. The rules and measures shall include:

- A construction site plan, including delineation of hazardous materials and hazardous waste storage areas, access and egress routes, drainage paths, emergency assemble areas, and temporary hazardous waste storage areas
- Materials Safety Data Sheets for all chemicals used and stored at the construction sites
- Spill prevention procedures, including employee spill prevention/response training
- An inventory list of emergency equipment
- Off-loading, safety, and handling procedures for each chemical
- Notification and documentation procedure
- Refueling of equipment only within designated areas of the construction staging area
- Regular inspection of all construction vehicles for releases

Mitigation Measure 5.11-1b: This mitigation measure applies to all proposed Program components. The City shall incorporate into contract specifications the requirement to locate hazardous materials or equipment that uses hazardous materials away from receiving waters or storm drain inlets. If heavy-duty construction equipment is stored overnight adjacent to potential receiving waters, drip pans shall be placed beneath the machinery engine block and hydraulic systems.

Significance After Mitigation: Less than Significant.

☒ **Impact 5.11-2: The proposed Program could disturb existing contaminated soils and/or groundwater during construction. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

The proposed Program could disturb contaminated soils or groundwater during excavation or dewatering activities.

Desalination Plant

Due to the proximity of the Industrial Park Area to sites that have known leaks from underground storage tanks, the dewatering or excavation could encounter chemicals, particularly petroleum products. Hazardous materials are not expected to be encountered at the Shaffer Road/Antonelli's Pond or the Terrace Point Areas. As part of its due diligence in reviewing the desalination site for property acquisition, the City would conduct a Phase 1 Hazardous Materials Site Assessment.

Conveyance and Pumping Facilities

Activities associated with pipeline installation in residential neighborhoods are unlikely to encounter contaminated soils. However, there is a potential to encounter hazardous material in commercial or industrial areas.

Alternative D-2 (Applicable to All Increments of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Since a regulatory database search was not conducted for these corridors, the proximity to sites with a history of leaks from underground storage tanks is not known. However, hazardous materials could be encountered, as the pipeline corridors traverse commercial areas.

Mitigation Measures

Mitigation Measure 5.11-2a: The City shall conduct due diligence review of the selected desalination area to ensure that known hazardous materials contamination is avoided. This shall include performance of a Phase 1 Hazardous Materials Site Assessment in conformance with American Society for Testing and Materials standards.

Mitigation Measure 5.11-2b: In the event that contaminated groundwater or soils are encountered in the field, either visually or by detection of odors, special procedures must be followed. These procedures, included in contractor specifications, shall be implemented in the event that noxious odors, discolored soil, oily water, or other indications of contamination are identified:

- Stop work in areas of contact.
- If contaminated soil or water is detected, call responsible agencies, including the Santa Cruz County Department of Environmental Health, the Central Coast RWQCB (if the groundwater

or surface water is contaminated by more than 25 gallons of hazardous waste), and the DTSC (if soils are contaminated by more than 25 gallons of hazardous waste).

- Fence off areas of contamination.
- Perform appropriate cleanup procedures.
- Segregate, profile, and appropriately dispose of all contaminated soils off site. Required disposal methods will depend on the types and concentrations of chemicals identified in the soil. Any site investigations or remediation shall be performed in accordance with applicable laws.

Significant After Mitigation: Less than Significant.

Impact 5.11-3: Operation of the desalination plant could result in the accidental release of hazardous materials, which could in turn affect human health and the environment. Less than Significant with EIR-Identified Mitigation.

<u>Alternative D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant. As mentioned in Chapter 4, Program Description, the operation of the desalination facility would necessitate the use of processes and chemicals for the treatment and desalination of ocean water. Typical water treatment chemicals would be stored and used at the desalination plant. Chemicals would be handled and stored in compliance with applicable laws and regulations, thus reducing the potential for an accidental release that could affect operators or the environment. Specific design features of chemical storage containment that increase the safe handling of hazardous substances would be determined at the design level and may include:

- Separate secondary containment for each chemical storage system
- Proper separation of incompatible chemicals
- Design of all chemical handling facilities to minimize or eliminate the risk of damage from earthquakes or other natural disasters (see Section 5.7, Geology and Soils)

Pursuant to state (California Health and Safety Code, Section 25500-25520) and local (Chapter 7.100 of the Santa Cruz County Code) regulations, the City must develop a Hazardous Materials Management Plan (HMMP) for the proposed desalination plant. In addition, the City of Santa Cruz's hazardous materials ordinance regulates and enforces the proper storage and handling of hazardous materials.

As described in Section 5.3, Land Use, Planning, and Recreation, Monarch Community School and Natural Bridges Elementary School are in the vicinity (within one-quarter mile) of the proposed desalination plant area. Accidental release of chemicals could affect these sensitive receptors.

Trucking on highways and local streets is the most common method of transporting hazardous materials and waste in Santa Cruz County. The DOT Office of Hazardous Materials Safety regulates transportation of hazardous materials. The hazardous material packaging and transportation requirements of the DOT are stringent, and accident rates involving hazardous materials are low. DTSC also regulates the generation, transportation, treatment, storage, and disposal of hazardous waste.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

The operation of Alternative D-2 would involve the storage, transport, and use of larger volumes of chemicals than Alternative D-1. The exact amount is not known at this time. Accidental release of chemicals could affect public health and the environment.

Alternative D-1 and D-2 (Applicable to Subsequent Increments of both Alternatives)

The potential expansion of the desalination plant from 2.5 mgd to 3.5 or 4.5 mgd in the future would increase the use, operation, transportation, and disposal of hazardous materials, thereby presenting greater risk to operators and the environment. The precise amounts of chemicals to be used are not known at this time. The City would update the HMMP accordingly. The emergency procedures established under the HMMP would ensure that accidental chemical releases would be responded to adequately, and impacts would be considered less than significant.

Mitigation Measures

Mitigation Measure 5.11-3: This mitigation measure applies to the desalination plant component. The City shall prepare an HMMP for the desalination facility. HMMPs are prepared for facilities that have a quantity of hazardous materials equal to or greater than a total weight of 500 pounds, or a total volume of 55 gallons, or 200 cubic feet at standard temperature and pressure for compressed gas. HMMPs include, but are not limited to, an inventory of chemical names and amounts, emergency response plans and procedures in the event of a release, procedures for the mitigation of a release or threatened release to minimize potential harm, evacuation plans and procedures, and training for new employees. Implementation of the HMMP would ensure that potential impacts associated with accidental release of hazardous materials, including the potential to affect schools within one-quarter mile of the proposed desalination area, would be less than significant.

Significant After Mitigation: Less than Significant.

REFERENCES

Environmental Data Resources, Inc. (EDR). September 17, 2003. *Regulatory Database Search for Santa Cruz IWP Proposed Desalination Site, Santa Cruz, CA 95060, Inquiry Number: 01048774.1r*.

Santa Cruz County Department of Environmental Health. Site Mitigation website: http://sccounty01.co.santa-cruz.ca.us/eh/haz-mat/alpha-si.pdf. Site accessed October 30, 2003.

5.12 TRAFFIC AND TRANSPORTATION

5.12.1 Introduction

This section describes the existing traffic network in the study area and its vicinity, as well as relevant policies and regulations of the affected jurisdictions. In addition, this section presents an evaluation of the potential traffic impacts that would result from Program implementation and mitigation measures to reduce such impacts.

5.12.2 Existing Conditions

Regional Setting

Figure 4-1 (Chapter 4, Program Description) depicts the regional road network in the study area vicinity. Highway 1 and Highway 17 serve as the main gateway into the Santa Cruz area and connect the region to other parts of California. Highway 1, generally a north-south-trending highway that extends along the coast of California, traverses Watsonville, the mid-county area, and the cities of Capitola and Santa Cruz. Within the Santa Cruz region, the four- to five-lane divided highway trends east to west, a short segment of which integrates within the local roadway network (called Mission Street). Highway 1 and Highway 17 converge near Ocean Street. Highway 17 is both a four-lane divided highway and a four-lane rural highway with a concrete median barrier and left-turn pockets. The highway generally trends north to south and is a major facility connecting Santa Cruz County and the Silicon Valley in Santa Clara County. Highway 17 becomes Interstate 880 in the vicinity of San Jose. Highway 9 runs from Highway 1 in the city of Santa Cruz northward through San Lorenzo Valley to Highway 35 at Saratoga and Los Gatos in Santa Clara County. It is a rural two-lane highway that generally parallels the San Lorenzo River and intersects Highway 236 at two junctures.

Transit Service

Regularly scheduled bus and shuttle services are provided by the Santa Cruz Metropolitan Transit District (SCMTD), Greyhound Bus Lines, Peerless Stages, and Santa Cruz Transportation (SCT). SCMTD provides year-round bus service in both the city and county. Greyhound Bus Lines, Peerless Stages, and SCT offer services outside of the region, to Oakland, San Francisco, and Los Angeles. SCMTD bus lines run throughout the study area, as described below for each proposed component.

Bikeways

The City of Santa Cruz, Santa Cruz County, and the City of Capitola have developed an extensive bikeway network in the study area consisting of Class I and Class II bikeways. A Class I bikeway (bike path) provides a separated right-of-way for exclusive use by bicycles and pedestrians. A Class II bikeway (bike lane) provides a striped lane for one-way travel on a street or highway. Bikeways are described for the proposed components below.

Study Area

The study area encompasses the local roadway network in the city of Santa Cruz, unincorporated Santa Cruz County (community of Live Oak), and the city of Capitola (see Figures 4-1, 4-2, 4-5, and 4-6 in Chapter 4, Program Description). Streets are classified in terms of access to adjacent property, mobility, design, use, and roadway capacity. Roadway categories include arterial streets, collector streets, and local streets. Arterial streets emphasize moving traffic and have limited access. Examples of arterial streets include Ocean Street, Mission Street, Capitola Road, and Soquel Avenue. Collector and local streets function as feeders to the arterial system. The primary function of local streets is to provide access to adjacent property. Examples of collector and local streets include Western Drive, West Cliff Drive, and Capitola Drive.

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

Desalination Plant Location

Industrial Park Area. The Industrial Park Area is in the city of Santa Cruz. Streets surrounding the Industrial Park Area include Delaware Avenue to the south, Natural Bridges Drive to the west, Swift Street to the east, and Mission Street (south of Highway 1) to the north. According to the *City of Santa Cruz General Plan*, Delaware Avenue is classified as an arterial street (City of Santa Cruz 1992). Adjacent to the proposed area, Delaware Avenue consists of two-way car and bicycle lanes. Natural Bridges Drive is an arterial street with a bike lane. Swift Street is also classified as a collector street and consists of two lanes with adjacent parking. As described above, Mission Street is a major arterial that integrates with Highway 1 in the city of Santa Cruz. The SPRR traverses the northern section of the Industrial Park Area. A bus line runs along Delaware Avenue.

Shaffer Road/Antonelli's Pond Area. The Shaffer Road/Antonelli's Pond Area is fronted by Shaffer Road to the west and Delaware Avenue to the south. Shaffer Road is a local roadway with no bicycle lanes (City of Santa Cruz 1992). Adjacent to the pond area, Delaware Avenue consists of two-way car and bicycle lanes. The SPRR rail line traverses the northern perimeter of the proposed area. A bus line runs along Delaware Avenue.

Terrace Point Area. The Terrace Point Area is bordered by the SPRR tracks to the north, Shaffer Road to the east, and the Pacific Ocean to the south. As mentioned above, Shaffer Road is a local roadway with no bicycle lanes. Delaware Extension and McAllister Way make up the roadway network within the Terrace Point Area.

Conveyance and Pumping Facilities

Raw Water Intake Pipeline (Corridor 1). The raw water intake pipeline (Corridor 1) begins at the intersection of West Cliff Drive and Sunset Avenue and generally extends westerly along Delaware Avenue to each of the proposed desalination plant areas. Street types encompassed within Corridor 1 include arterial streets (Delaware Avenue), collector streets (Swift Street, Almar Avenue, West Cliff Drive), and local roadways (Chase Street, Plateau Avenue, Alta Avenue, Oxford Way, Sunset Avenue, John Street, Getchell Street, and Fair Street) (City of Santa Cruz 1992). The raw water pipeline would be located within public street right-of-ways. Both Swift Street and Delaware Avenue contain existing Class II bicycle lanes. Generally, Corridor 1 traverses industrial and residential uses, with intermittent public and park uses in the vicinity. A bus line runs along Delaware Avenue and Fair Street.

Junction Structure. The existing junction structure is located on the beach south of West Cliff Drive. The Pacific Coast Bicycle Route runs along West Cliff Drive.

Treated Water Distribution Pipeline (Corridor 2). Corridor 2 begins at the Industrial Park Area and extends north along Western Avenue to Meder Street. Western Avenue is a divided two-lane roadway that traverses primarily residential uses and includes limited pullout parking areas. Meder Street, a two-lane collector street, is located along the northern portion of the study area and runs along the perimeter of University Terrace Park and Peace Cemetery. A bus line runs along Western Avenue.

Treated Water Distribution Pipeline (Corridor 3). Corridor 3 is primarily a north-south corridor that extends from Delaware Avenue to the intersection of Cardiff Court and Cardiff Place. Street types within Corridor 3 include arterial highways (Mission Street), arterial streets (Bay Drive, Bay Street, Delaware Avenue), collector streets (Meder Street, King Street, Swift Street), and local roadways (Iowa Drive, Cardiff Place, Cardiff Court, Escalona Drive, Anthony Street, Kenneth Street, Olive Street, Mesa Lane). Corridor 3 traverses residential, commercial, and industrial uses. Four-lane roadways include Mission Street and Bay Drive. According to the *City of Santa Cruz General Plan and Local Coastal Program*, the section of Bay Street between High Street and Highway 1 is classified as a congestion management roadway (City of Santa Cruz 1992). Residential and industrial streets within the corridor generally consist of two lanes. Two cul-de-sacs cross the corridor, including Escalona Court and Las Ondas Court. Bay Street, Bay Drive, Swift Street, and Delaware Avenue include bicycle lanes or paths. Several bus routes traverse the proposed pipeline area.

Concentrate Discharge Pipeline (Corridors 1 and 4). The concentrate discharge pipeline includes two options: Corridors 1 and 4. Corridor 1 is described above for the raw water pipeline corridor. Corridor 4 is an east-west corridor that runs along Delaware Avenue and terminates at the WWTP. Street types encompassed within Corridor 4 include: arterial streets (Delaware Avenue, Laguna Street, Bay Street), collector streets (Columbia Street, Swift Street, Almar Avenue, West Cliff Drive), and local roadways (Chase Street, Plateau Avenue, Alta Avenue, Oxford Way, Sunset Avenue, John Street, Getchell Street, Fair Street, National Street, Centennial Street, Liberty Street, Monterey Street, Santa Cruz Street, Gharkey Street). Delaware Avenue and Bay Street both contain bicycle lanes. Generally, the corridor traverses industrial and residential uses, with intermittent public and park uses in the vicinity. Several bus routes traverse the proposed pipeline area.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Corridor 5 begins at the intersection of Soquel Avenue and Ocean Street and continues easterly along Soquel Avenue and Soquel Drive to Porter Street. Corridor 5 would cross Highway 1. According to the *Santa Cruz County General Plan and Local Coastal Program*, both Soquel Avenue and Soquel Drive are classified as arterial streets with bike lanes (Santa Cruz County 1994). A bus line runs along Soquel Avenue.

Corridor 6 begins at the intersection of Soquel Avenue and Ocean Street and continues easterly, initially along Soquel Avenue, and then via Capitola Road to 41st Avenue. According to the *Santa Cruz County General Plan and Local Coastal Program*, Capitola Avenue is classified as an arterial street with a bike lane. The *City of Capitola General Plan* classifies the intersection of Capitola Road and 41st Avenue as a major congestion area (City of Capitola 1989). Ocean Street is classified as a main arterial with a bike lane. Several bus routes run on Capitola Avenue and Soquel Avenue.

Corridor 7 begins at the intersection of Soquel Avenue and Ocean Street and continues south along Ocean Street and East Cliff Drive, east along Murray Street and the SPRR right-of-way, and then north along 41st Avenue until it intersects with Capitola Avenue. According to the *City of Capitola General Plan*, several intersection and signal improvements are proposed for 41st Avenue to reduce traffic delays (City of Capitola 1989). East Cliff Drive and Murray Street are arterial streets with bike lanes.

Designated Truck (Haul) Routes

The *City of Santa Cruz General Plan and Local Coastal Program* (1992) designated a set of visitor/coastal access and truck routes to facilitate movement of visitor traffic and commodities. The truck route system includes major highways such as Highway 1 (including Mission Street where the highway intersects), Highway 17, and Highway 9; and major arterial streets such as Bay Street, Morrissey Boulevard, and Soquel Avenue (City of Santa Cruz 1992). Truck routes channel trucks through the community and away from residential and other areas where they would be a nuisance. Highways 1, 17, and 19, Bay Street (between High Street and Highway 1), and Soquel Avenue (between Front Street and Highway 1) have been designated as county-wide congestion management roadways (City of Santa Cruz 1992).

Traffic Volume

Weekday traffic within the study area consists primarily of commute traffic during the peak traffic periods, and a mix of trips generated by residential, commercial, and industrial uses throughout the day. Daily traffic on roadways in the study area vicinity is generally highest on the congestion management roadways. Table 3.12-1 identifies the most current traffic volumes on project roadways, if available. Traffic volume data are unavailable for the city of Capitola.

Construction Trip Generation

The first phase of construction is expected to start in 2006 and would be completed by 2008 to 2010. The specific timing and duration for construction of each Program component would depend on its phasing, the permitted period of construction, weather, and other factors. Construction-related truck trips would include trucks off-hauling soil and delivering equipment. Up to 14 round-trips per day are estimated for the construction of the desalination plant and conveyance and pumping facilities (hauling off demolished asphalt and sub-base and delivery of materials). This estimate does not account for any off-haul of soil to the landfill (it is assumed that soil would be reused on site to the extent feasible). Worker truck trips (traveling to and from the work site) are estimated at approximately 45 round-trips per day on average, for both the desalination plant and conveyance pipeline components. The total trips would be up to nearly 60 per day. These estimates are intended to provide an order of magnitude for analysis purposes. If the order of magnitude is substantially exceeded, the analysis would be redone in the next phase of project-level evaluation.

Table 5.12-1
Existing Daily Traffic Volumes on Roadways in the Study Area

ROADWAY	LOCATION	AVERAGE DAILY TRAFFIC (VEHICLES PER DAY)	RELATIONSHIP TO THE PROPOSED PIPELINE CORRIDORS
City of Santa Cruz[1]			
Bay Drive/Bay Street	Escalona to Iowa (NB) Escalona to Iowa (SB) Escalona to Kenneth (NB) Escalona to Kenneth (SB)	6,408 6,876 7,172 8,453	Treated Water Distribution
Centennial Street	Gharkey to Santa Cruz (NB) Gharkey to Santa Cruz (SB) Delaware to Bay (NB) Delaware to Bay (SB)	224 203 640 358	Concentrate Discharge
Escalona Drive	Bay to Laurent (EB) Bay to Laurent (WB)	1,001 1,026	Treated Water Distribution
Gharkey Street	Columbia to National (EB) Columbia to National (WB)	39 39	Concentrate Discharge
King Street	Ladera to Miramar (NB) Ladera to Mirammar (SB) Miramar to Baldwin (NB) Miramar to Baldwin (SB)	788 853 1,767 1,547	Treated Water Distribution
Mesa Lane	King to Escalona (NB) King to Escalona (SB)	221 109	Treated Water Distribution
Mission Street	Baldwin to Palm (WB) Baldwin to Palm (EB)	14,637 13,941	Treated Water Distribution
Ocean Street	Barson to Broadway (NB) Barson to Broadway (SB) Leonard to Water (SB) Leonard to Water (NB)	6,231 4,219 12,970 12,100	D-2 Pipelines
Santa Cruz Street	Columbia to National (EB) Columbia to National (WB) National to Centennial (EB) National to Centennial (WB)	16 66 74 6	Concentrate Discharge
Soquel Avenue	Mentel to Park Way (WB) Mentel to Park Way (EB) Pine to Pennsylvania (WB) Pine to Pennsylvania (EB)	14,422 15,977 6,035 6,551	D-2 Pipelines, Corridors 5 and 6

(continued on next page)

Table 5.12-1 (continued)
Existing Daily Traffic Volumes on Roadways in the Study Area

ROADWAY	LOCATION	AVERAGE DAILY TRAFFIC (VEHICLES PER DAY)	RELATIONSHIP TO THE PROPOSED PIPELINE CORRIDORS
Murray Street	Seabright to Lake (WB) Seabright to Lake (EB)	11,036 12,058	D-2 Pipelines, Corridor 7
Santa Cruz County[2]			
Highway 1	Soquel Drive to Morrisey Boulevard	114,000 (2002)	D-2 Pipelines
Soquel Avenue	7th Avenue (EO) 7th Avenue (WO)	23,745 (Nov 2001) 15,336 (May 1998)	D-2 Pipelines
Soquel Drive	Rodeo Gulch Road (WO) 41st Avenue (WO) 41st Avenue (EO)	19,307 (Feb 2004) 23,494 (Jun 2004) 14,981 (Jul 2003)	D-2 Pipelines
41st Avenue	Brommer Street (NO) Brommer Street (SO) Capitola Road (NO) Soquel Drive (SO)	19,818 (Jan 2004) 18,986 (Jun 2004) 28,831 (Jul 2003) 19,150 (Jan 2001)	D-2 Pipelines
Capitola Avenue	7th Avenue (Eo) 7th Avenue (WO) 17th Avenue (EO) 17th Avenue (WO)	16,885 (Jul 1997) 16,790 (Jul 2003) 16,969 (Aug 2003) 15,446 (Jul 2000)	D-2 Pipelines
Porter Street	Soquel Drive (SO)	12,120 (Sep 2000)	

Sources: [1] City of Santa Cruz 2003; [2] Santa Cruz County 2003

Note: NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; WO = West of; EO = East of; NO = North of; SO = South of.

Construction Trip Distribution

Construction-related trips would be scattered both throughout the day and geographically, as work would occur at multiple locations. Worker truck trips would be concentrated in the morning and afternoon peak hours, although construction-related truck trips would be limited to off-peak hours, as designated in the encroachment permits. Construction-related truck trips would be limited to the specified haul routes identified above to the extent feasible.

5.12.3 Regulatory Framework

The General Plans of affected jurisdictions provide policies regarding circulation planning, pedestrian/bicycle systems, mass transit, and road systems. Policies relevant to the proposed Program identified in the general plans and local coastal programs of the City of Santa Cruz, Santa Cruz County, and the City of Capitola of are presented in Appendix B.

5.12.4 Impacts and Mitigation Measures

Significance Criteria

In accordance with Appendix G of the *CEQA Guidelines*, the proposed Program would have a significant impact to traffic and circulation if it would:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections);
- Result in inadequate parking capacity;
- Result in inadequate emergency access;
- Increase wear and tear on designated haul routes;
- Disrupt bus service, rail operations, or navigation;
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or from construction activities; or
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

The proposed Program would not disrupt navigation, as construction of the intake would be confined within a barge that would not restrict navigational traffic. The proposed Program does not propose permanent features on public or private roadways that would increase safety hazards, as permanent features would be located either on selected parcels or buried within roadways. The proposed Program would not affect adopted plans and policies supporting alternative transportation, as all permanent facilities would be sited away from alternative transportation stations and thoroughfares. Therefore, these criteria are eliminated from further discussion.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Evaluation of subsequent expansion is also provided where relevant. Table 5.12-2 summarizes potentially significant impacts.

Table 5.12-2
Summary of Potential Impacts – Traffic and Transportation

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.12-1: Short-term traffic delays for vehicles traveling past construction zones	◐	◐	--	--	--	◐	○	○	○	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.12-2: Increase in traffic from construction-related vehicles on roadways serving the Program components	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.12-3: Implementation of the proposed Program could increase traffic volume associated with desalination facility operations	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.12-4: Construction of the proposed Program could generate demand for parking spaces for construction worker vehicles	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Impact 5.12-5: Disruption of access to adjacent land uses and streets, potentially causing safety problems	◐	◐	--	--	--	◐	○	○	○	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.12-6: Increase in wear and tear on the designated haul routes used by construction vehicles	◐	◐	--	--	--	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Impact 5.12-7: Temporary disruption to bus service along proposed pipeline corridors	◐	◐	--	--	--	◐	○	○	○	◐	◐	◐	◐	◐	◐	◐	◐

Table 5.12-2
Summary of Potential Impacts – Traffic and Transportation

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIVE D-2 PUMP FACILITIES
Impact 5.12-8: Potential to affect rail operations	◐	◐	--	--	--	--	--	--	--	--	--	◐	--	--	--	◐	--

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable
[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.
[2]Impacts associated with the specific facilities of the desalination plant.

Impacts and Mitigation

⌧ **Impact 5.12-1: Construction of the proposed Program would result in short-term traffic delays for vehicles traveling past construction zones. Less than significant with EIR-Identified Mitigation.**

<u>General Discussion (Applicable to both Alternatives)</u>

As described in Chapter 4, Program Description, construction techniques used to install the pipelines would include open-trench construction and special trenchless techniques for sensitive crossings. Open-trench construction would require a minimum easement of 20 feet. Trenchless techniques would also require sufficient area to facilitate pipeline installation. Pipeline installation could therefore reduce travel width of the roadways and result in traffic delays for vehicles traveling past the construction zone(s). Proposed pipeline corridors are located within residential, commercial, and industrial uses. Depending on the location and timing of construction, the impact of lane closures (although temporary) could be significant. Particularly in commercial areas where traffic volumes are high, lane closures during peak-hour traffic could result in a significant impact. Further investigation of the impacts on area roadways would be conducted at a project-level of detail once the pipeline alignments have been selected.

To the extent feasible, two-way traffic would be maintained on all roadways. On roadways with restricted travel widths, alternate one-way travel should be maintained. Although not expected, if sufficient road width is not available, complete closure would be required; in this case, signage would be placed to detour traffic onto alternative roads. Implementation of a traffic control plan would reduce temporary traffic-related impacts to less-than-significant levels. Potential impacts for Program components are described below.

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

Construction of desalination facilities would not directly affect area roadways, as construction would be confined within the proposed parcel.

Conveyance and Pumping Facilities

The raw water, treated water distribution, and concentrate discharge pipelines would be located primarily within residential and industrial uses. A short segment of the proposed pipeline is located along Mission Street, a commercial area. Travel widths for these streets vary, as do the volumes of traffic. The daily traffic volumes are shown in Table 5.12-1, above. Based on the available data, daily traffic volumes along Corridors 1 through 4 range from less than 100 to less than 1,000 vehicles. It is unlikely that closure of a lane along these roads (with the exception of Bay Street, a major access corridor to UCSC, Highway 17, and Mission Street–Highway 1) would result in significant delays; construction during the peak hour (except on Bay and Mission Streets) would not likely require restrictions. Peak-hour restrictions could be necessary for construction within busy streets, and the crossing of Mission Street could require special construction techniques. Once the alignments have been selected, detailed design would be performed to determine areas requiring special construction or peak-hour restrictions. In addition, development and implementation of a traffic control plan would address traffic-related concerns and reduce potential impacts to less-than-significant levels.

The proposed pumping facility would be located within or adjacent to the existing junction structure. Staging could require closure of the adjacent parking area or roadway, and thus could result in traffic delays for motorists traveling past the construction area. Development and implementation of a traffic control plan would address traffic-related concerns and reduce potential impacts to less-than-significant levels.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. Corridors 5 and 6 would be located within commercial and residential areas, and Corridor 5 would cross Highway 1. Traffic volumes for the commercial areas average 15,000 to 25,000 vehicles per day on arterial streets (i.e., Soquel Avenue and Soquel Drive). The closure of a lane on these streets could result in significant delays, particularly during the peak hours. However, bi-directional traffic would be maintained, as these streets have more than two lanes in each direction. Construction activities along these streets could be limited to nonpeak hours to reduce flow restrictions. Development and implementation of a traffic control plan would reduce potential impacts to less-than-significant levels. Corridor 7 would be located generally along a railroad alignment; however, where the corridor traverses surface streets, potential impacts would be similar to those identified for Corridors 5 and 6.

Mitigation Measures

Mitigation Measure 5.12-1a: This mitigation measure applies to the pipeline component. The City shall, to the extent feasible, select pipeline alignments that would not require complete closure of the roadway during construction.

Mitigation Measure 5.12-1b: This mitigation measure applies to all proposed Program components. The City shall obtain and comply with encroachment permits from the affected jurisdictions, including the City of Santa Cruz and, if applicable, Santa Cruz County and the City of Capitola (for the D-2 pipelines).

Mitigation Measure 5.12-1c: This mitigation measure applies to the pipeline component. The City shall prepare a detailed traffic control plan for the affected roadways and intersections for the selected alignments. The traffic control plan shall comply with the requirements of the affected jurisdiction's encroachment permit requirements. The traffic control plan shall include, but shall not be limited to, the following:

- Identify specific methods for maintaining traffic flows for affected streets. This shall include identifying roadway locations where special trenching techniques (e.g., trenchless construction) would be used to minimize impacts to traffic flow and operations. Locations where trenchless construction could be required include but are not limited to the crossing of Mission Street–Highway 1
- Identify areas where construction would be limited to nonpeak hours to reduce traffic flow restrictions, in compliance with the encroachment permit
- Maintain the maximum amount of travel lane capacity during nonconstruction periods and provide flagger-control at sensitive construction sites to manage traffic control and flows
- Limit the construction work zone in each block to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone
- Coordinate construction activities (time of year and duration) to minimize traffic disturbances adjacent to schools and commercial areas
- Post advanced warning of construction activities to allow motorists to select alternative routes in advance
- Require appropriate warning signage and lighting for construction zones
- If closure of a roadway is required, identify appropriate and safe detour routes; install signage warning of road closure and detour routes

The traffic control plan shall be reviewed for appropriateness and approved by the governing Public Works Department.

Mitigation Measure 5.12-1d: This mitigation measure applies to the pipeline component. The City shall expedite construction while maintaining safety, such that disturbances would be kept as short as possible.

Mitigation Measure 5.12-1e: This mitigation measure applies to the pipeline component. The City shall arrange for a 24-hour emergency telephone resource to address public questions and complaints during Program component construction.

Significance After Mitigation: Less than Significant.

⌧ **Impact 5.12-2: Construction of the proposed Program would generate traffic on roadways serving the Program components from construction-related vehicles. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Construction-related traffic includes worker trips and truck trips carrying equipment and material to and from the work sites. The impact of construction-related traffic would be a temporary and intermittent lessening of the capacities of access streets and haul routes because of the slower movements and larger turning radii of construction trucks compared to passenger vehicles. Construction traffic would not result in any long-term degradation in operating conditions on proposed Program roadways.

The removal of excavation spoils and delivery of equipment and material, as well as worker-related truck trips, would generate traffic along project haul routes. As discussed in the settings section, this analysis assumes an average number of daily construction trips of up to 60. The number of trips would depend on the amount of excavated soils requiring off-haul to a landfill, the number of trips required for delivery of equipment and material, and the number of crews working on site. Increases in construction-related traffic on area roadways could result in temporary, significant impacts if such increases occur during the peak hours on roadways with high traffic volumes. Construction-related truck trips would likely be scattered both throughout the day and geographically, as construction on different components could occur simultaneously. For certain high-volume roadways, weekday construction hours could be limited to nonpeak hours, per the conditions of the encroachment permit.

Implementation of Mitigation Measure 5.12-2 would reduce potential impacts associated with an increase of traffic on area roadways to less than significant.

Mitigation Measures

Mitigation Measure 5.12-2: This mitigation measure applies to all proposed Program components. As part of the traffic control plan, the City shall include in contract specifications the need to schedule, to the extent feasible, two or more daily work sites such that their relative locations would disperse truck trips over a number of different haul routes, thereby lessening the number of truck trips on any one road.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.12-3: Implementation of the proposed Program could increase traffic volume associated with desalination facility operations. Less than Significant (no mitigation required). Mitigation could be required if the projected number of employees would substantially exceed the assumed amount.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

The proposed Program would require new employees at the desalination plant. Although the exact number of employees has not yet been determined, it is assumed that the order of magnitude would not exceed double digits. This analysis assumes that approximately 30 daily truck trips would be generated during operation of the desalination plant (see Section 5.6, Noise, for the basis of this assumption). These trips would be associated with employees commuting to and from work and driving to other facility sites for maintenance purposes, as well as the monthly delivery of chemicals. This addition of trips is not expected to degrade roadway or intersection capacities, resulting in a less-than-significant impact. As design progresses and more information is available, the City would reassess the potential for increased traffic volume. However, if the projected number of employees substantially exceeds the assumed number, then Mitigation Measure 5.12-3 would be implemented.

Alternative D-1 (Applicable to Subsequent Increments of this Alternative Only)

Expansion of the desalination plant could result in additional employees commuting to and from work, maintenance trips, and increases in the number of chemical deliveries. The incremental increase in truck trips would unlikely be substantial (an order of magnitude). Therefore, it is not expected that expansion of the plant would substantially increase traffic volume to an extent that would affect roadway capacities. In the event that substantial additional numbers of employees are required, Mitigation Measure 5.12-5 would be implemented.

Mitigation Measures

Mitigation Measure 5.12-3: If the number of employees working at the desalination plant and chemical delivery trucks would exceed the order of magnitude assumed for this analysis, the City shall reevaluate long-term effects of worker-related truck traffic on area roadways in subsequent project-level EIR(s).

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.12-4: Construction of the proposed Program could generate demand for parking spaces for construction worker vehicles. Less than Significant. Mitigation recommended but not required.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Construction activities would occur at the selected desalination area, along pipeline alignments, and at the beach near Sunset Street. Potential impacts are discussed by component, as follows.

Desalination Plant

There would likely be sufficient space at the desalination area to accommodate staging and worker vehicle parking. Therefore, parking demand associated with development of this component would not displace existing street parking.

Conveyance and Pumping Facilities

Pipeline installation along roadways could displace available parking spaces in the construction work zone. Within residential areas, construction activities would occur during the day when residents are at work, and therefore sufficient parking to accommodate the public and worker vehicles would likely be available on nearby streets. However, in commercial areas where parking spaces are limited, sufficient space for public and worker vehicles might not be available. In this case, the public and workers might have to park outside the immediate area of affected streets; the increased walking distance from a parking space to the work site or nearby destination is not considered to be a significant impact. The mitigation measure described below, however, is recommended to reduce worker-related parking in areas with limited street parking.

Mitigation Measures

Mitigation Measure 5.12-4: This mitigation measure applies to the pipeline components. It is recommended that the City provide off-street parking for construction worker vehicles, or if that is impractical, workers could be shuttled to the work site from an off-site location.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.12-5: Construction of the proposed Program would disrupt access to adjacent land uses and streets, potentially causing safety problems. Less than Significant with EIR-Identified Mitigation.**

Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)

Desalination Plant

Construction of the proposed desalination plant would not disrupt access to adjacent land uses, as activities would be confined to unoccupied parcel(s) that do not serve as access to other uses. Equipment and material would be stored away from roadways or entrances into the work site to ensure emergency access.

Conveyance and Pumping Facilities

Pipeline construction could affect access to adjacent uses for emergency and regular vehicles, bicyclists, and pedestrians, potentially causing safety hazards. Lane closures could be required on specific roadways during pipeline construction. To the extent feasible, bi-directional traffic would be maintained, although in areas with narrow roadways, bi-directional traffic might not be feasible and alternate one-way traffic flow would be maintained (see Measure 5.12-1). Road closures are not expected, although this need would be identified once the specific pipeline alignments have been selected. Two cul-de-sacs cross Corridor 3 at Escalona Street. Construction would be sited away from street entrances to maintain access to these streets, as alternative access is not available.

Raw Water Intake Pipeline/Concentrate Discharge Pipeline (Corridor 1). Monarch Community School is located on the western side of this corridor. Depending on the final pipeline location, construction activities could affect schools by limiting access or increasing safety hazards.

Treated Water Distribution Pipeline. Two cul-de-sacs cross Corridor 3 at Escalona Street. Construction would be sited away from street entrances to maintain access to these streets, as alternative access is not available.

<u>Alternatives D-2 Applicable to the First Increment of this Alternative Only)</u>

The Branciforte Elementary School is located south of Corridors 5 and 6 (Water Street). The Live Oak Elementary School is located south of Corridor 6 (Capitola Road). Depending on the final pipeline location, construction activities could affect schools by limiting access or increasing safety hazards.

<u>Mitigation Measures</u>

Mitigation Measure 5.12-5a: This mitigation measure applies to all proposed Program components. As part of the traffic control plan for the proposed Program, the City shall develop comprehensive strategies for maintaining emergency access, such as maintaining steel trench plates at the construction sites to restore access across open trenches. During non-working hours, trenches or open pits shall be covered with steel plates or by backfilling. Access for emergency vehicles shall be maintained at all times. The City shall also notify emergency service providers of the timing, location, and duration of construction activities throughout Program implementation.

Mitigation Measure 5.12-5b: This mitigation measure applies to the pipeline component, specifically Corridor 3. The City shall site pipeline alignments on the opposite side of cul-de-sac entrances, to the extent feasible, to maintain access to streets.

Mitigation Measure 5.12-5c: This mitigation measure applies to the pipeline component, specifically Corridors 1, 5, or 6. As part of the traffic control plan, the City shall identify schools along the alignment and locate pipelines to minimize access restrictions and reduce safety hazards. If feasible, construction activities shall be performed during the months of school vacations.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.12-6: Construction vehicles would increase wear and tear on the designated haul routes. Less than Significant with EIR-Identified Mitigation.**

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

The use of heavy trucks to transport equipment and material to and from the proposed Program work site(s) could affect road conditions on the designated haul routes by increasing the rate of road wear. The degree to which this impact would occur depends on the design (pavement type and thickness) and the existing condition of the road. Major arterials and collectors are designed to accommodate a mix of vehicle types, including heavy trucks. The Program's impacts are expected to be negligible on those roads.

Residential roads are generally not built with a pavement thickness intended to withstand substantial truck traffic volumes. Although these roads would be avoided to the extent feasible, residential roadways could be used to access selected pipeline installation sites. To minimize the potential wear and tear of these streets, surveys would be conducted prior to the start of work to provide the City a method to assess roadway conditions after Program construction. Implementation of Measure 5.12-6, below, would reduce potential impacts to roadways to less-than-significant levels.

<u>Mitigation Measures</u>

Mitigation Measure 5.12-6: This mitigation measure applies to all proposed Program components. The City shall incorporate into contract specifications the following requirements: conduct a preconstruction survey of road conditions on key access routes to the project site. The pavement conditions of local streets and designated roads judged to be in good condition for use by heavy truck traffic shall be monitored. Any roads damaged by construction shall be repaired to a condition equal to or better than that which existed prior to construction activity.

Significance After Mitigation: Less than Significant.

⌦ **Impact 5.12-7: Construction of the proposed Program would temporarily disrupt bus service along proposed pipeline corridors. Less than Significant with EIR-Identified Mitigation.**

<u>Alternatives D-1 and D-2 (Applicable to the First Increment of both Alternatives)</u>

As described in the setting section, bus service is provided on many of the streets along the pipeline corridors. Construction activities would temporarily affect transit operations by limiting access to bus stations, thereby requiring relocation of bus stops. Bus route detours are not expected since the closure of entire roadways would not likely be necessary. However, should complete road closure be required, then the City would work with the SCMTD to temporarily detour bus lines; this need would be assessed once the pipeline alignment has been selected.

Mitigation Measures

Mitigation Measure 5.12-7a: If pipeline installation would require closure of a lane where a bus stop is located, the City shall, in coordination with SCMTD, temporarily relocate the bus stop.

Mitigation Measure 5.12-7b: The City shall determine the necessity of roadway closure once the alignment has been selected. If complete closure is necessary where a bus line traverses, then the City shall coordinate with SCMTD to identify detour bus routes.

Significance After Mitigation: Less than Significant.

Impact 5.12-8: Construction of the proposed Program would affect rail operations. Less than Significant with EIR-Identified Mitigation.

Alternative D-1 (Applicable to the First Increment of this Alternative Only)

The treated water distribution pipeline (Corridor 3) would require crossing of the SPRR tracks. Construction activities would affect rail operations if open-trench construction is used across the railroad tracks. To minimize potential conflicts to railroad operation, a trenchless construction technique would be necessary.

Alternative D-2 (Applicable to the First Increment of this Alternative Only)

Alternative D-2 Pipelines (Corridors 5, 6, and 7) and Pumping Facility

In addition to the facilities described above, Alternative D-2 would also include distribution pipelines (Corridors 5, 6, and 7) and a pumping facility. The placement of a pipeline along Corridor 7 could result in impacts to SPRR rail operations, depending on the placement distance from the rails. The easement varies in width within the proposed alignment, and in certain areas there may be space constraints (i.e. bridge crossings). If Corridor 7 is selected for pipeline installation, the City would coordinate with SPRR to identify minimum setback distances such that both entities would be able to operate and maintain their facilities without potential conflicts or hazards.

Mitigation Measures

Mitigation Measure 5.12-8a: This mitigation measure applies to all proposed Program components. The City shall implement trenchless construction techniques for the crossing of the SPRR tracks.

Mitigation Measure 5.12-8b: This mitigation measure applies to the D-2 pipeline, Corridor 7. If Corridor 7 is selected as the preferred D-2 pipeline alternative, the City shall coordinate with the SPRR to determine the necessary setback from the railroad tracks for placement of the pipeline along the SPRR easement.

Significance After Mitigation: Less than Significant.

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5.13 ENERGY

5.13.1 Introduction

This section describes the existing energy environment in the Program area and regulations within the nation and the state. In addition, this section presents an evaluation of the potential energy related impacts that would result from Program implementation and provides mitigation measures to reduce such impacts.

5.13.2 Existing Conditions

Petroleum and natural gas supply over 50 percent of the energy consumed in California. The remaining portion of the state's energy demand is met by a variety of resources, including coal, nuclear, geothermal, wind, solar, and hydropower (CEC 2001). The current annual energy consumption in California (for all purposes including transportation) ranks the state as the tenth largest consumer of energy in the world and second, behind Texas, in the United States (CEC 2001; EIA 2003). However, in terms of energy consumption per person, California ranks 50th among the 50 states and the District of Columbia, Rhode Island ranks 51st (CEC 2004a). California's 12 percent of the national population uses 7 percent of the nation's electricity (CEC 2001). The State of California is located in the Western Electricity Coordinating Council (WECC) region and shares power generation capacity with other states and countries in the region. The WECC region encompasses a vast area of nearly 1.8 million square miles. It is the largest and most diverse of the 10 regional councils of the North American Electric Reliability Council (NERC). WECC's service territory extends from Canada to Mexico. It includes the provinces of Alberta and British Columbia, the northern portion of Baja California, Mexico, and all or portions of the 14 western states in between. California produces approximately 78 percent of the electricity consumed within the state and imports approximately 22 percent from the WECC.

The Energy Information Administration (EIA) indicates that at the end of 2002, California had an electrical generation capacity of 56,663 megawatts (mW) and produced 184,210,030 megawatt-hours (mWh) (EIA 2003; CEC 2004b). This represents an actual production of approximately 37 percent of total capacity (EIA 2003; CEC 2004b). (Total mWh capacity was derived by the following formula: 365 days multiplied by 24 hours a day multiplied by 56,663 mW, which equals 496,367,880 mWh.) However, electricity cannot be built up during low-demand periods and stored for later use. Thus, the potential for a particular project to adversely affect electricity distribution and availability is related more appropriately to a project's increase in demand during peak-demand periods, such as hot summers.

According to the California Energy Commission's (CEC) California's Summer 2004 Electricity Supply and Demand Outlook report (CEC 2004 Report), prudent use and close monitoring of California's electricity resources was necessary to ensure adequate supplies between June and October 2004, particularly during very hot summer days, which are expected to occur at an average rate of 1 in 10 years (CEC 2004c). The CEC 2004 Report indicates that electricity reserves may fall below 5 percent during peak-demand periods in the summer of 2004, which may prompt the California Independent System Operator (CAISO) to initiate voluntary conservation programs, interruptible-load programs, and other emergency response programs. While the CEC 2004 Report indicates that the electricity supply through 2010 is adequate for hot and normal-temperature years, these projections are based on the anticipated completion of proposed power plants. The CEC warns that, by 2008, reserves may again fall below 5 percent if additional power plants are not added between 2005 and 2010.

The WECC indicates there will be an increase in generation capacity in the WECC region of 62,623 mW by 2007 due to construction of new power plants and upgrades of existing power plants. According to the CEC, as of July 1, 2004 the state had an electrical generation capacity of 62,182 mW (CEC 2004c). Additionally, 11 power plants with a generation capacity of 4,901 mW are under construction. Of these 11 power plants, 10 power plants, with a generation capacity of 4,311 mW, are scheduled to be completed by the end of 2006 and the last is scheduled for completion in late 2008 (CEC 2004a). These power plants would bring total electrical generation capacity in California to 66,493 mW by the end of 2006 and 67,083 mW by the end of 2008. In addition, the CEC has approved 13 more proposed electrical generation facilities that would produce an additional 6,813 mW (CEC 2004c). The majority of the approved plants are expected to be completed by 2011. Assuming a 37 percent-efficiency operating schedule, power plants in California would generate approximately 215,517,112 mWh per year in 2007, and 217,429,420 mWh by 2009.

Pacific Gas and Electricity Company (PG&E) serves the study area and would supply the electricity and natural gas for the proposed Program. PG&E obtains its energy supplies from power plants and natural gas fields in northern California and from energy purchased from other members of the WECC and delivered through high-voltage transmission lines. In 2001, PG&E delivered approximately 76 million mWh to 4.8 million customers and 288 billion cubic feet (BCF) of natural gas to 4 million customers (PG&E 2003). PG&E owns or leases 8,255 mW of power generating capacity.

5.13.3 Regulatory Framework

National Energy Policy

The National Energy Policy, developed in May 2001, proposes recommendations on energy use and on the repair and expansion of the nation’s energy infrastructure. The policy is based on findings that growth in U.S. energy consumption is outpacing the current rate of production. Over the next 20 years, the growth in the consumption of oil is predicted to increase by 33 percent, natural gas by over 50 percent, and electricity by 45 percent. Whereas the U.S. economy has grown by 126 percent in the past three decades, energy use has increased by only 30 percent. Automobiles currently use 60 percent less gasoline than they did in 1972. While the federal policy promotes further improvements in energy use through conservation, it focuses on increased development of domestic oil, gas, and coal and the use of hydroelectric and nuclear power resources. To address the over-reliance on natural gas for new electric power plants, the federal policy proposes research in clean coal technology and expanded generation from landfill gas, wind, and biomass sources.

California

The State of California regulates energy consumption under Title 24 of the California Code of Regulations. The Title 24 Building Energy Efficiency Standards were developed by the CEC and apply to energy consumed for heating, cooling, ventilation, water heating, and lighting in new residential and nonresidential buildings. The CEC adopted the first Title 24 standards in 1978 and updates them periodically to incorporate new energy-efficiency technologies and methods. The most recent standards were adopted in 2001 and updated on October 1, 2002. The amended Title 24 standards apply to the design and insulation of structures and to the space-cooling equipment installed in these structures. Under Assembly Bill 970, signed September 6, 2000, the CEC will update and implement its appliance and building efficiency standards to make the “maximum feasible” reductions in unnecessary energy consumption.

5.13.4 Impacts and Mitigation Measures

Significance Criteria

In accordance with Appendix G of the *CEQA Guidelines*, the proposed Program would have a significant impact to energy resources if it would:

- Result in the wasteful, inefficient, or unnecessary consumption of energy;
- Require the construction of additional energy infrastructure facilities; or
- Increase reliance on energy resources that are not renewable.

Methodology

Impacts are analyzed for both alternatives (D-1 and D-2) and for specific components where impacts would differ between the alternatives. Evaluation of plant expansion to 4.5 mgd is also provided where relevant.

Impacts and Mitigation

<u>General Discussion</u>

Construction energy expenditures would include both direct and indirect uses of energy. Construction activities would directly consume fuel and electricity, along with the indirect consumption of energy to extract and fabricate materials used in developing the proposed Program facilities. Construction energy consumption would be a one-time impact and would not be an ongoing drain on finite natural resources. Construction energy consumption would primarily be in the form of fuel and would not affect available energy resources. Therefore, energy consumption associated with construction activities would not be significant.

Operational energy consumption would primarily consist of electricity for water treatment, plant operations, pump stations, and other electronic systems. It is assumed that 20 kWh would be required to produce 1,000 gallons of potable water without energy recovery systems incorporated into the proposed Program. With the incorporation of energy recovery systems, as described in Chapter 4, Program Description, it has been estimated that 12 kWh would be required to produce 1,000 gallons of potable water. Based on this data, the proposed desalination plant would require up to 50,000 kWh, or 50 mWh, per day to produce 2.5 mgd of potable water without energy recovery systems; with the energy recovery systems, 30,000 kWh, or 30 mWh would be required (20 mWh less than without the energy recovery systems). As the energy recovery systems are included in the proposed Program, the following analysis employs 12 kWh per 1,000 gallons to discuss potential impacts from operation of the proposed Program.

Natural gas consumed by the proposed Program would be related to space heating of buildings. To determine the estimated natural gas consumption for the proposed Program, average daily consumption factors were taken from the SCAQMD's 1993 CEQA Air Quality Handbook. Based on these usage factors, it has been assumed that the proposed desalination plant would consume approximately 340 cubic feet of natural gas per day and approximately 10,342 cubic feet per month (SCAQMD 1993)[1] . If the desalination plant were operated 24 hours per day and 365 days per year, as could occur under Alternative D-2, the proposed Program would consume 124,100 cubic feet per year, which represents 0.0043 percent of the natural gas delivered by PG&E to its customers in 2001. The proposed Program would conform to Title 24, and in so doing would not use energy in an inefficient or wasteful manner. Therefore, the proposed Program would not place a significant burden on the available natural gas supply.

[1] The energy consumption estimates based on usage factors published in the CEQA Air Quality Handbook are conservative. The calculations assumes a maximum heated area of 5,170 square feet and a natural gas usage factor of 2 cubic feet per building square foot per month. Actual energy consumption will likely be less than these values.

Table 5.13-1
Summary of Potential Impacts – Energy

IMPACT	OPERATION SCENARIOS[1]				ALTERNATIVES D-1 AND D-2[2]									ALTERNATIVE D-2[2]			
					INTAKE FACILITIES		DESALINATION AREA			CONVEYANCE FACILITIES				CONVEYANCE AND PUMPING FACILITIES			
	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-2, 3.5 AND 4.5 MGD	RAW WATER INTAKE	RAW WATER PUMP FACILITIES	INDUSTRIAL PARK	SHAFFER ROAD / ANTONELLI'S POND	TERRACE POINT	CORRIDOR 1	CORRIDOR 2	CORRIDOR 3	CORRIDOR 4	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7	ALTERNATIE D-2 PUMP FACILITIES
Impact 5.13-1: The proposed Program could result in the wasteful, inefficient, or unnecessary consumption of energy	○	○	○	○	--	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.13-2: The proposed Program would require the construction of additional energy infrastructure facilities	○	○	○	○	--	--	--	--	--	--	--	--	--	--	--	--	--
Impact 5.13-3: The proposed Program would increase reliance on energy resources that are not renewable	○	○	○	○	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: EDAW 2003

Notes: -- = Not Applicable; ○ = Less than Significant (no mitigation measures required); ◐ = Significant but Mitigable; ● = Significant and Unavoidable

[1]Impacts associated with the construction and/or operation of the first and subsequent phases of Alternatives D-1 and D-2.

[2]Impacts associated with the specific facilities of the desalination plant.

Impact 5.13-1: The proposed Program could result in the wasteful, inefficient, or unnecessary consumption of energy. Less than Significant.

Alternative D-1 (Applicable to the First Increment of this Alternative Only)

The proposed Program would utilize energy in the form of electricity to process seawater into potable water and would consume natural gas for space heating. Neither of these uses of energy is considered unnecessary, and the proposed Program would conform to Title 24. As discussed previously, the project operator, City of Santa Cruz Water Department, would use energy recovery technology to produce the greatest quantities of water for the least cost, and the most effective method of cutting costs is to reduce the electricity required per unit of potable water produced. Based on available information, Alternative D-1 would require 1,250 kW an hour, or 30,000 kWh per day, during operation, which is anticipated to occur six months out of a six-year period. This would result in a total consumption of 5,475 mWh during that period. A typical California household consumes 6,500 kWh annually (CEC 2003). As such, based on these assumptions, Alternative D-1 would consume roughly the same amount of electricity as 842 households over the six-year planning period. This quantity of electricity is not significant compared to the total amount of generated electricity or the overall generation capacity in the state or in the PG&E service area. Similarly, when comparing the hourly demand (1.25 mW) to the generation capacity of PG&E (8,255 mW) or within the state (62,182 mW), the proposed Program would not place a substantial burden on the existing or planned electricity generation system. Once the desalination process and plant design have been finalized, project-specific review would be conducted prior to construction to ensure the process does not use energy in a wasteful or inefficient manner and that all feasible energy recovery systems have been installed.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

Under Alternative D-2, 1.25 mgd would be produced for 5.5 years, and 2.5 mgd would be produced for the remaining six months. During the 1.25-mgd production cycle, the proposed desalination plant would require 625 kW per hour, or 15,000 kWh per day, and 5,475 mWh per year. Over a 5.5-year period that would result in the consumption of approximately 30,113 mWh, or approximately the same as 4,633 households. During the six month period when the plant would produce 2.5 mgd, electricity need would be the same as for Alternative D-1. However, the total consumption under Alternative D-2 for the six-year period would be approximately 35,588 mWh, almost 6.5 times as much as Alternative D-1 over the same time period, or approximately 5,475 households. This quantity of electricity is not significant compared to the total amount of generated electricity or the overall generation capacity in the state or in the PG&E service area. Similarly, when comparing the hourly demand (1.25 mW, or 0.625 mW) to the generation capacity of PG&E (8,255 mW) or within the state (62,182 mW), the proposed Program would not place a substantial burden on the existing or planned electricity generation system. Similar to Alternative D-1, once the desalination process and plant design have been finalized, project-specific review would be conducted prior to construction to ensure the process does not use energy in a wasteful or inefficient manner and that all feasible energy recovery systems have been installed.

<u>Alternative D-1 (Applicable to the Subsequent Increments of this Alternative Only)</u>

As with the first increment of Alternative D-1, subsequent increments of Alternative D-1 would not operate continuously. Subsequent increments would operate for eight months out of a six-year period. Under the subsequent increments of Alternative D-1, it is estimated that operation of the proposed Program would consume approximately 10,220 mWh and 13,140 mWh to produce 3.5 mgd and 4.5 mgd, respectively. This would be equivalent to the annual consumption of approximately 1,572 and 2,022 households. This quantity of electrical consumption is not significant when compared to the overall production in the PG&E service area or in the state. On a peak basis, under subsequent increments, production of 3.5 mgd and 4.5 mgd would require 1.75 mW and 2.25 mW per hour, respectively. These quantities do not represent a significant load when compared to the generation capacity of PG&E or the state.

Alternative D-2 (Applicable to the Subsequent Increments of this Alternative Only)

As with the first increment of Alternative D-2, subsequent increments of Alternative D-2 would operate continuously at 1.25 mgd, with short-term increases in production to levels similar to those discussed for subsequent increments of D-1. Under the subsequent increments of Alternative D-2, normal operation would last 5.25 years (63 months), while the short-term increases under the subsequent increments of Alternative D-2 would operate for eight months out of the six-year period. It is estimated that operation of the proposed Program would consume approximately 38,964 mWh and 41,884 mWh over the six-year period to produce 3.5 mgd and 4.5 mgd, respectively. This would be equivalent to the annual consumption of approximately 5,994 and 6,444 households. This quantity of electrical consumption is not significant when compared to the overall production in the PG&E service area or in the state. On a peak basis, under subsequent increments, production of 3.5 mgd and 4.5 mgd would require 1.75 mW and 2.25 mW per hour, respectively. Under normal operations (i.e., production of 1.25 mgd), hourly demand would be 0.625 mW. These quantities do not represent a significant load when compared to the generation capacity of PG&E or the state.

The subsequent increments of Alternative D-2 also provide a contingency that the City may decide to utilize 1.25 mgd year-round in addition to the 1.25 mgd used by the District. The total energy consumption would double during the nondrought, operational periods, but would be the same during the drought periods. Peak demand would not exceed that described under Subsequent Increments for both alternatives. If at some point in the future, the City intends to follow through with this option, additional analysis would be required.

Mitigation Measures

None required.

⌦ **Impact 5.13-2: The proposed Program would require the construction of additional energy infrastructure facilities. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to all Increments of both Alternatives)

The proposed Program includes the construction of an on-site transformer to provide adequate power and power regulation to the proposed Program facilities and a new power line. The size would depend on the need but industrial projects typically require these types of facilities. However, the proposed Program would utilize existing power lines and natural gas mainlines in the surrounding area to obtain electricity and natural gas. As previously discussed, the proposed Program would not create a substantial burden on the existing electrical or natural gas delivery system and would not necessitate the development of additional power generation facilities or natural gas facilities.

Mitigation Measures

None required.

☒ **Impact 5.13-3: The proposed Program would increase reliance on energy resources that are not renewable. Less than Significant.**

Alternatives D-1 and D-2 (Applicable to all Increments of both Alternatives)

The proposed Program would require energy to operate, and the majority of that energy would be in the form of electricity. PG&E would be the primary provider of electricity to the proposed Program. PG&E produces electricity by using both nonrenewable and renewable fuel sources, and obtains electricity from other generators that also use both nonrenewable and renewable fuel sources. As previously discussed, the proposed Program would not result in a substantial increase in demand on the existing electrical generating capacity of PG&E or its providers. Furthermore, the proposed Program would not change PG&E operations and therefore would not increase reliance on nonrenewable energy sources. Section 7.4.12 includes a discussion of energy consumption by desalination facilities in California. Renewable energy sources are not being considered for on-site use. The amount and type of land required to use either solar or wind energy is not available on site.

Mitigation Measures

None required.

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Chapter 6 Growth Inducement and Secondary Effects of Growth

6.1 INTRODUCTION

The California Environmental Quality Act (CEQA) requires the Lead Agency to evaluate whether a proposed Program will directly or indirectly induce growth of population, economic development, or housing construction. Specifically, *CEQA Guidelines* Section 15126.2(d) states the need to evaluate the potential for a proposed Program to "foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a waste water treatment plant might, for example, allow for more construction in service areas)."

Directly induced growth is associated with residential or commercial development projects that would result in a population increase or in an increase in the number of employees. Indirectly induced growth is associated with reducing or removing barriers to growth, or creating a condition that encourages additional population or economic activity. Ultimately, both types of growth induction result in population increase, which "may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects" (*CEQA Guidelines* Section 15126.2[d]). Other potential environmental impacts related to growth include increased traffic, air emissions, and noise; degradation of water quality; and conversion of agricultural or open space to accommodate development.

Under CEQA, growth inducement is not considered necessarily detrimental, beneficial, or of little significance to the environment. Typically, the growth-inducing potential of a project or program would be considered significant if it encourages growth or a concentration of population in excess of what is assumed in appropriate master plans, land use plans, or in projections made by regional planning agencies such as the Association of Monterey Bay Area Governments (AMBAG). Significant growth impacts could also occur if the project provides infrastructure or service capacity to accommodate growth beyond the levels currently permitted by local or regional plans and policies. In general, growth inducement by a project is considered a significant impact if it directly or indirectly affects the ability of agencies to provide needed public services, or if it can be demonstrated that the potential growth significantly affects the physical environment in some other way, such as through an increase in traffic congestion or deterioration of air quality.

The potential of the IWP to induce growth, or cause secondary effects related to growth, is a key issue of concern within the Santa Cruz community, noted at the scoping meeting held November 2003, as well as during the development of the IWP and the IWP committee meetings. The preliminary analysis of potential environmental impacts conducted during the IWP process did not result in a definitive conclusion on whether the proposed project would result in growth, nor did that analysis determine a preferred IWP alternative in terms of growth. Instead, the potential of the IWP to induce growth was deferred to this EIR.

6.2 EXISTING CONDITIONS

6.2.1 Profile of the Santa Cruz City Water Service Area

The Santa Cruz water system serves a geographic area that encompasses the entire City of Santa Cruz, Live Oak, and adjoining unincorporated areas of Santa Cruz County, as well as a small part of the City of Capitola. The service area is situated between the foothills of the Santa Cruz Mountains and the shoreline of Monterey Bay and is bounded in a number of areas by a greenbelt consisting of city-owned park and open space lands. East of 41st Avenue, water service is provided by Soquel Creek Water District. The preservation of open space to the west and north lends a natural geographic definition to the City and represents a barrier to any future physical expansion of the water service area. Accordingly, any growth and redevelopment that does happen is expected to do so within the confines of the existing service area boundary.

The land use pattern in the Santa Cruz water service area is predominantly residential, including a mix of single family homes, multiple residential units, mobile homes and various other types of housing. Commercial development is centered in downtown Santa Cruz, around 41st Avenue in Capitola and along the major transportation corridors, such as Mission, Ocean, Soquel, and Water streets. Industrial activity is located primarily in the Harvey West area and along Delaware and Swift streets on the west side of Santa Cruz.

The current population of the City's water service area is estimated to be about 90,000. Of this total, approximately 55,000 people, or 62 percent, live inside the Santa Cruz City limits (City of Santa Cruz Water Department 2004). The other 37 percent, or 33,000 live in the unincorporated area of the County, and 1 percent live in the City of Capitola (US Census Bureau website 2003). The water system supports a total of approximately 36,000 existing housing units and an employment base of about 45,000 jobs. UC Santa Cruz is the areas' largest and most influential public institution, as well as the City's largest water customer, with student enrollment now numbering about 14,500 (UCSC 2004).

The water use characteristics reflect the above mix of land uses across the service area, with just under two-thirds of the total annual water deliveries going for residential purposes. The remaining amount is divided among different commercial, industrial, institutional, and irrigation uses. There are currently 23,800 active water service connections. About two percent of City water goes to agricultural use.

6.2.2 Profile of the Soquel Creek Water Service Area

The Soquel Creek Water District (SqCWD) serves a population of more than 45,000 through approximately 14,400 service connections in four service areas within mid-Santa Cruz County. The SqCWD encompasses seven miles of shoreline of Monterey Bay and extends one to three miles inland into the foothills of the Santa Cruz Mountains, essentially following the County Urban Services Line. Ninety percent of the SqCWD' customers are residential and there are no agricultural connections to the system. The City of Capitola is the only incorporated area within the SqCWD. Unincorporated communities include Aptos, La Selva Beach, Rio Del Mar, Seascape, and Soquel.

6.2.3 Factors Influencing Growth and Land Use

There are multiple factors, both private and public, that affect the amount, location, type, and density of development that is permitted and built within the City service area. All three jurisdictions (the City and County of Santa Cruz and Capitola) have general plans, local coastal programs, zoning regulations, and development standards that serve to regulate and manage growth. The adopted General Plans were most recently updated in the late 1980s and early 1990s. To a large degree, the goals and policies contained in these documents are intended to protect existing neighborhoods and preserve environmental resources as a way to maintain the quality of life and unique sense of place for those that live, work, and visit the area. Thus with certain exceptions, major changes in current land use patterns are not expected in the near future.

Vacant land is also diminishing. Most of the residential parcels within the water service area have already been developed. Within the City of Santa Cruz, only about 4 percent of residentially zoned land remains undeveloped. The same is true in the part of Capitola served by the City. Most of the undeveloped or underutilized residential land remaining in the City's service area is located in the County's jurisdiction.

Since 1990, the City has added 1,900 new water connections, which equates to an average growth rate of 126 connections, or about 0.5 percent per year. The majority of new accounts were residential.

In the Soquel Creek Water service area, growth and development is managed mainly by the County of Santa Cruz, as the City of Capitola is nearly built out. Between 1990 and 2000, the District added 1,628 new connections, which equates to an average of 163 new connections, or about 1 percent per year. Since 2000, the rate of new connections in the Soquel Creek Water District has leveled off to an average of about 50 to 60 per year.

In both service areas growth rates are relatively low. Much of the development in recent years is construction on vacant land and infill, renovation, remodeling, conversions, second units, and additions to existing residential and commercial buildings that increase density on already developed or underutilized land, as opposed to development patterns seen elsewhere in California that is achieved through annexation and expansion into new service territory.

As a result of low growth rates, the current population of the City of Santa Cruz is about 8 percent less than was predicted for this year in the 1990-2005 General Plan. The present population of the City is approximately 55,000, while the General Plan anticipated a population of almost 60,000 by 2005. In recent years, the population across Santa Cruz County appears to be stabilizing, or even declining, according to the U.S Census Bureau.

6.2.4 Population Projections

The water demand forecast developed as part of the Integrated Water Plan was based on the regional population and employment projections prepared by AMBAG, which were guided by approved general plans (1997). The AMBAG population projections are intended as a planning tool, not as an exact prediction of future events. These projections are summarized by jurisdiction through the year 2020 in Table 6.2-1.

Table 6.2-1
Population Forecast for the Santa Cruz City Water Service Area

	2000	2005	2010	2015	2020
City of Santa Cruz	55,232	60,045	63,563	63,974	64,386
Santa Cruz County	32,378	32,632	33,072	34,254	36,779
City of Capitola	1,270	1,302	1,322	1,342	1,362
Service Area Total	**88,875**	**93,979**	**97,957**	**99,570**	**102,527**

Table 6.2-2 below shows the estimated population projections for the SqCWD from 2000 to 2030 according to the District's adopted Urban Water management Plan (2001). The District' own water demand projections are also based on past AMBAG population projections and on land use data obtained from the County of Santa Cruz and the City of Capitola.

Table 6.2-2
Population Forecast for the Soquel Creek Water District Service Area

	2000	2005	2010	2015	2030
Estimated Service Area Population	**45,000**	**49,198**	**52,216**	**56,252**	**56,758**

6.2.5 Planned Housing Development and University Growth in the City Water Service Area

The cities of Santa Cruz and Capitola and the County of Santa Cruz are in the process of, or have just completed, updating their housing elements to address their required regional fair-share housing needs established by AMBAG. These documents set forth goals and objectives for housing production, rehabilitation, and conservation through the year 2007. The plans identify generally where sites are available for housing to be built and describe programs to facilitate new housing opportunities, but this does not necessarily mean such housing actually will be constructed. Also unknown is what type of housing will actually be built over the next few years.

The City of Santa Cruz (in the Housing Element of the General Plan) is currently planning for an additional 2,167 units, a fair amount of which already has been approved and is under construction. This figure includes a mix of housing types ranging from detached single family homes to small scale infill like accessory dwelling units.

The County is planning for a total of 3,411 units to be built Countywide through 2007, of which perhaps 1,400 units potentially would be located within the City water service area. Capitola is projecting 337 units by 2007 in its housing element, but only a small number of these are expected to fall into the City's water service area.

Assuming that future development has equal numbers of single and multi-family housing units, the above housing plans represent a total of 3,567 new homes through 2007 and a potential increase in residential water demand alone on the order of about 206 million gallons per year once they are all built.

The draft 2005 – 2020 Long Range Development Plan (2005 LRDP) for the University has recently been completed and is undergoing CEQA review. The 2005 LRDP updates and supersedes the 1988 LRDP and plans for development sufficient to accommodate a projected increase in students to approximately 21,000 by 2020. In conjunction with the increase in student enrollment and research activity, the number of faculty and staff at UC Santa Cruz is projected to increase by 1,800 to an estimated total of 5,900. The 2005 LRDP proposes a building program and a land use plan to support the projected growth in campus population and to enable expanded and new program initiatives. The 2005 LRDP envisions adding 4.1 million gross square feet of additional academic and support space and housing to the existing 4.8 million gross square feet of existing and approved space for a total of 8.9 million gross square feet (UCSC 2005).

6.2.6 Planned Housing Development in the Soquel Creek Water Service Area

The County in its housing element is planning for a total of 3,411 units to be built Countywide through 2007. It is unknown how many of these units potentially fall into the Soquel Creek Water District service area. Capitola is projecting 337 units by 2007 in its housing element, the majority of which would be located in the Soquel Creek Water service area.

6.3 REGULATORY FRAMEWORK

Decisions concerning land use within the Santa Cruz water service area are made by three separate jurisdictions: the City of Santa Cruz, the County of Santa Cruz, and the City of Capitola. The Santa Cruz City Council serves as the governing body for all policy matters concerning the physical growth and economic development of the City. In the unincorporated area, the County Board of Supervisors is the policy making body for land use decisions. The Capitola City Council does the same in the small part of Capitola served by the Santa Cruz water system. All three jurisdictions have Redevelopment Agencies that plan an active role in promoting economic development and affordable housing throughout the City water service area.

Of these three agencies, only the Santa Cruz City Council has the dual role of decision making with regard to both water supply and land use. Neither the Board of Supervisors nor the Capitola City Council has this responsibility. Instead, they rely on the City's continuing issuance of "will serve" letters, and those of other water agencies, as evidence of sufficient water prior to approving new development projects in their jurisdictions.

On University property, land use decisions are made by the Regents of the University of California, which as a decision-making body is constitutionally autonomous from local government, even though it is the city that provides many of the services upon which the university is dependent for such growth.

In the Soquel Creek Water District, decisions concerning growth and land use are made by the County and the City of Capitola. As a special district, the Soquel Creek Water District is charged with the basic responsibility of managing water supplies and the provision of water service to growth that is approved by local land use authorities. The District itself does not have land use authority, even though it involves itself in related matters of environmental protection and community growth.

Regulations relating to growth for each jurisdiction that are applicable to the proposed Program are described below.

6.3.1 City of Santa Cruz

Growth and development within the City of Santa Cruz is carefully regulated by the City's general plan land use policies, zoning regulations, and strongly influenced by environmental constraints. The City is more than 96 percent built out; consequently new development is accomplished through redevelopment rather than through development of vacant lands.

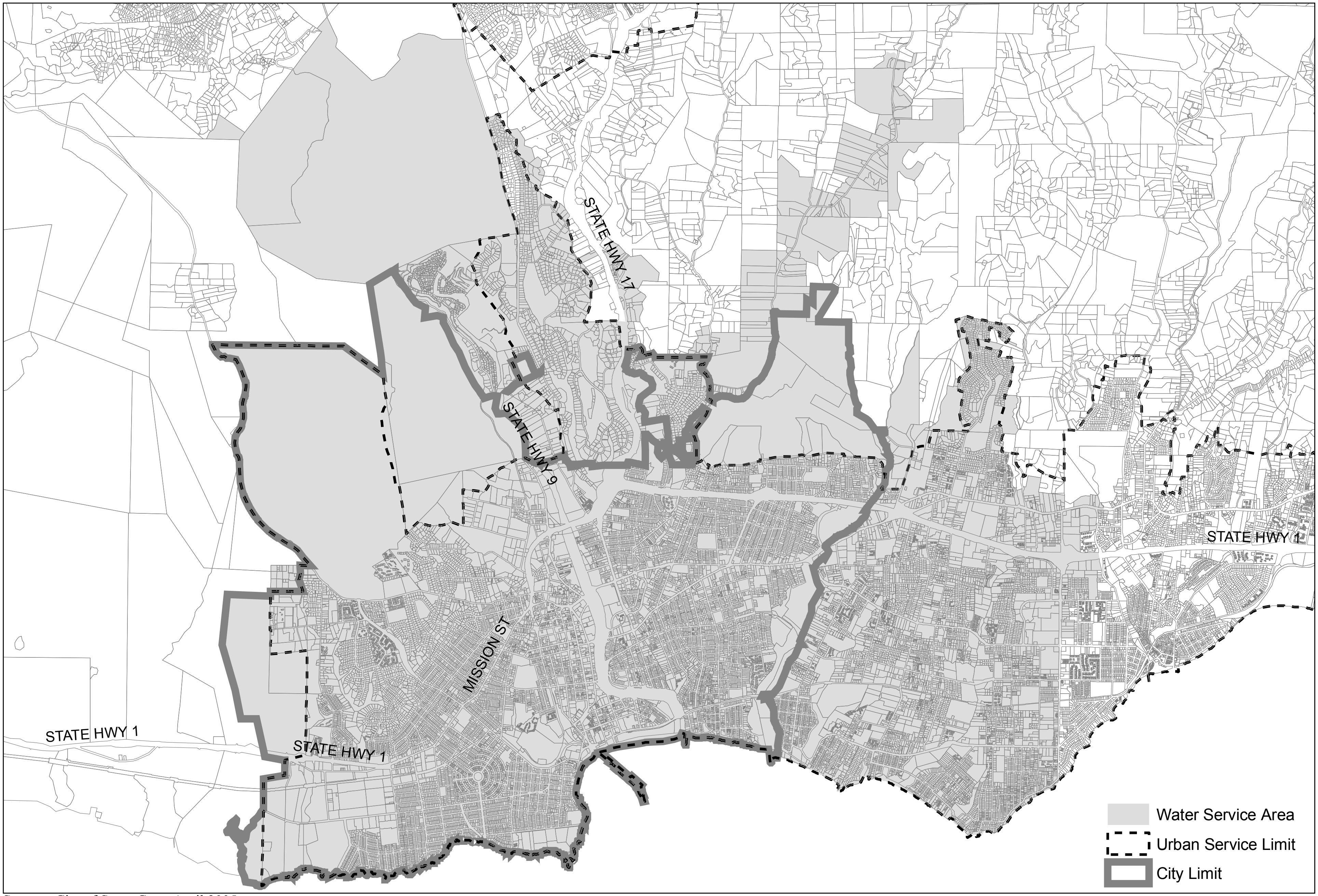
The City has had a long-standing moratorium on any new connections on the north coast water system and has had a consistent policy since the late 1980's prohibiting expansion of the water service area. Both of these local controls play an important role limiting growth and prohibiting urban sprawl in the unincorporated part of the service area and the region.

6.3.2 Santa Cruz County

Land use decisions in the County of Santa Cruz are regulated by the policies contained in the Santa Cruz County General Plan and Local Coastal Program (1994) and various ordinances contained in the County code. The two most important County policies that guide the County's overall land use framework are discussed below.

Measure J was passed in 1973 by Santa Cruz County voters to manage growth in the County. To implement Measure J, a series of measures were created with the intention of providing high quality development while also ensuring adequate public services and protection for the County's natural and agricultural resources. One such measure is a basic land use policy that separates urban and rural areas through a distinct boundary and thus serves to encourage new development to locate in urban areas and to protect agricultural land and natural resources in the rural areas. Urban and rural areas are separated by an Urban/Rural Boundary, where the Urban Services Line (USL) (Figure 6-1) defines where urban services may be provided. In general, the areas within the USL are served by public water systems, sanitary sewer facilities, and receive an urban level of fire protection.

As shown in Figure 6-1, the County Urban Services Line lies alongside or within the City water service boundary, meaning that it provides another protection against expansion of the current service area on top of and in addition to existing City policy regarding the water system boundary.



Source: City of Santa Cruz, April 2005

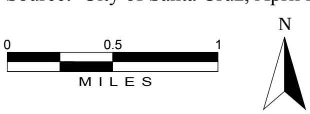


FIGURE 6-1

Relationship Between City Water Service Area, County Urban Service Limit Line, and City Boundary

In addition to directing where growth occurs, the County also has policies to manage the rate of growth. Specifically, Chapter 17.01, Growth Management, provides policies which govern the future growth and development of the County as well as regulate the character, location, amount, and timing of future development. The County recognizes the potential for environmental impact and economic effects associated with rapid population growth, and has therefore established ordinances that provide for the "establishment, each year of an annual population growth goal which would limit population growth during that year to an amount which represents Santa Cruz County's fair-share of statewide population growth" (Santa Cruz County 2003). Chapter 17.04.010 outlines that "each year's population growth goal is to include plans to assist and encourage the production of a number of housing units equal, on the average, to not less than 15 percent of the newly constructed units during any three consecutive years which will be capable of purchase or rental by persons with average or below average incomes" (Santa Cruz County 2003). In the last three years, the allowable growth rate for entire Santa Cruz County was set at 0.5 (Ginsberg 2004). To ensure the viability of the ordinance, a residential permit allocation system was established allotting 75 permits for developments of less than five units within the Urban Service Line and 74 permits for developments of five units or more (Ginsberg 2004).

The County in its General Plan also has a detailed land use element that describes land use classifications and policies that establishes a pattern of land utilization in the unincorporated area and sets out standards for the density of population and the intensity of development for each of the land use classifications described.

6.3.3 City of Capitola

The Capitola General Plan does not provide any specific reference to a planning horizon, but refers to AMBAG population projections through the year 2005. There are no permit restrictions on development or growth limitation policies for the City of Capitola (Malloy, pers. comm. 2004). As discussed above for the City of Capitola, growth is limited by the lack of developable land.

6.4 IMPACTS AND MITIGATION MEASURES

6.4.1 Significance Criteria

Growth impacts would be considered significant if the implementation of the Draft Integrated Water Plan would:

- remove an obstacle to growth (CEQA Guidelines 15126.2(d)).
- bring water service to a geographic area where it is not now available.
- be inconsistent with adopted general plans concerning population or housing growth.
- lessen existing planning regulations and land use controls with the program.
- induce growth at the University.
- be operated within the City's service area in a way that would utilize intended drought reserve capacity to meet needs for ongoing growth, leaving the city vulnerable in the future.

Impacts and Mitigation

☒ **Impact 6-1: The program could remove an obstacle to growth. Less than Significant for Alternative D-1 and D-2 (First Increment), and Significant but mitigable for Alternative D-1 (Subsequent Increment).**

<u>Alternative D-1 (Applicable to the First Increment of this Alternative only)</u>

Within the City water service area, currently there is no restriction or obstacle to population, economic, or housing growth that is linked to the actual availability of water, other than the long standing moratorium in place on the north coast system. Water service connections continue to be issued to the public at the rate of about 125 per year upon payment of appropriate fees and construction, if needed, of infrastructure necessary to serve individual parcels undergoing development. The City water system has a limited amount of excess capacity remaining under normal water supply conditions which allows continuing growth to occur.

The primary purpose of the desalination component of the proposed Program is to provide additional water supply for use in dry years when available surface water sources are unable to meet existing demands. The first increment of both Alternative D-1 and D-2 would not change the manner in which the City processes applications for service connections for new residential or commercial buildings or the number of connections issued annually, and therefore, would not remove an obstacle to growth or induce growth.

The water conservation component of the proposed Program potentially could be construed as growth inducing. Water conservation programs have helped offset any increase in overall water demand in recent years, keeping water production levels constant over time, and delaying the point in time when water demand reaches the system capacity. However, the City is committed to continue implementing water conservation programs, even under the no program alternative.

With respect to fostering the construction of additional housing, both the City and County and their Redevelopment Agencies actively promote the development of new housing units, especially affordable housing, via their respective housing elements. The proposed Program would not change the jurisdictions' ongoing efforts to meet their regional housing objectives. The environmental impacts of constructing additional housing on the environment were appropriately evaluated and described in the Santa Cruz County 1994 General Plan and Local Coastal Program EIR and the City of Santa Cruz General Plan and Local Coastal Program 1990-2005 EIR and subsequent environmental documents that were prepared in connection with the adoption of the most current housing elements.

<u>Alternative D-2 (Applicable to the First Increment of this Alternative Only)</u>

The first increment of Alternative D-2 is intended to provide water during drought years to meet existing demand for the City, and to provide supplemental water supply to the District.

As with the City of Santa Cruz, there is no restriction or obstacle to population, economic, or housing growth that is linked to the actual availability of water at this time in the Soquel Creek Water District, even though the District is acknowledged as being in overdraft in the Purisima basin, is presently pumping in excess of the safe yield of the basin, and is threatened with the possibility of seawater intrusion. A few years ago, the District considered but rejected a moratorium on new development, opting instead to institute a policy by which new applicants for new water service are required to purchase and install sufficient numbers of low consumption plumbing fixtures to offset 1.2 times the amount of water the new development is projected to use so that there is a "zero" impact on the District's supply. Growth and development in the Soquel Creek service area is thereby allowed to continue, for the time being.

The provision of a supplemental source of water supply to the District would therefore not change, increase, or accelerate the rate of population growth or housing development compared to existing conditions. With respect to new development approval, the County and City of Capitola continue to issue development permits which determine the density of population, and the type and intensity of land use in the District's service area. The Board of Supervisors has taken no action recently to outright prohibit development, using its authority under the county code to declare a groundwater emergency in the mid-County area.

<u>Alternative D-1 (Applicable to Subsequent Increment of this Alternative Only)</u>

As with the initial increment, the priority of the desalination plant in future years is to provide drought protection for the City. According to the water system modeling conducted for the IWP, there is the possibility that the plant would also be needed on a year round basis at 1.25 mgd to accommodate future growth. The increase in capacity of the subsequent increment from 2.5 mgd to 3.5 or 4.5 mgd is needed to maintain the 15 percent curtailment level in future drought years as water demand increases over time, and is unrelated to possible year round supply needs which could be met with the initial increment alone.

The City is now in the process of updating its General plan for the 2005-2020 planning horizon. Accordingly, the future population envisioned and the type and intensity of land use that will be allowed in the City under the next General Plan is unknown at this time.

Recent work by the City shows that the capacity of the existing water system likely may be reached in the near future, possibly in the timeframe covered by the upcoming General plan, or certainly in the next (City of Santa Cruz 2004). Without the proposed Program, the water system could reach its capacity limit in normal years sometime in the next decade or later, potentially preventing future growth in the service area. The provision of additional supply (through a change in plant operation from drought years only to include normal years) might then be perceived as removing a possible future obstacle to growth. At this point, this is considered to be a potentially significant impact.

However, additional environmental review will be required for any expansion of the desalination plant or proposed change in operation to ensure that the capacity and manner of operation of the plant is consistent with future population projections and City/County planning documents, and to ensure that development of additional water supply for Santa Cruz is responsive to rather than built out ahead of planned growth.

<u>Alternative D-2 (Applicable to Subsequent Increment of this Alternative Only)</u>

The subsequent increment of Alternative D-2 makes the same 1.25 mgd production capacity available to the SqCWD as the initial increment, with the potential for a short term use of up to 2.5 mgd to restore the groundwater basin. The additional capacity in the subsequent increment is driven by the City’s needs and does not affect the SqCWD.

Based on analysis by SqCWD, by 2010 vacant lands within the Urban Services Line (USL) will be developed. By 2020, vacant lands outside the USL but within the LAFCO-approved Sphere of Influence (SOI) for the District will be developed and some increased density infill will occur within the USL. The supplemental water would provide for population growth and development in these areas.

At this time, it is unknown whether water service will constitute an obstacle to growth in the mid-County area in the next ten to twenty years. Water could become an obstacle to growth if the District were faced with deteriorating groundwater conditions and chose to cease issuing new connections to protect the groundwater basin, or if the Board of Supervisors declared a groundwater emergency and suspended issuance of building permits until the situation improved. Under those circumstances, the provision of a supplemental source of water in the mid-County area potentially could remove an obstacle to growth. There is no evidence at the time of this EIR’s preparation, though, that either of these actions by the District or by the Board of Supervisors is likely.

Any potential impacts of growth inducement in the mid-County area should be addressed and if necessary, mitigated, in the District’s water supply planning documents and accompanying EIR.

<u>Mitigation Measure</u>

For Alternative D-1, subsequent environmental review shall be required for any expansion of the desalination plant or proposed change in operation to ensure that the capacity and manner of operation of the plant is consistent with future population projections and City/County planning documents, and to ensure that development of additional water supply for Santa Cruz is responsive to planned growth rather than provided ahead of it.

Significance After Mitigation: Less than significant.

☒ **Impact 6-2: The Program could bring water service to a geographic area where it is not now available. No Impact for Alternative D-1 and D-2 (First and Subsequent Increments).**

Alternatives D-1 and D-2 (Applicable to the First and Subsequent Increments of both Alternatives)

The proposed Program would not affect the geographic area where the City provides water service. The Program does not involve expansion of the existing the water service area boundary, which is fixed by City Council policy, nor does it involve rescinding the long-standing moratorium on new connections along the north coast. No land that is presently undeveloped outside the service area would be made developable by the addition of new water supply. Alternative D-1 would provide water only in the established water service area presently covered by the existing water distribution system.

SqCWD is not contemplating expansion of its service area, but has the obligation as a special district to serve within its current political boundary. The provision of supplemental water may enable growth and development in vacant areas not now served, but only to the extent that they are inside the existing District boundary and consistent with the County's land use regulations. No land that is presently undevelopable outside the District's service area would be made developable by bringing in a supplemental water supply.

For these reasons, no impact would occur under either alternative and the Program is considered not to be growth inducing.

Mitigation Measure

None required.

☒ **Impact 6-3: The program would be inconsistent with adopted general plans and other regional plans concerning population or housing growth. No impact for Alternative D-1 and D-2 (First Increment Only); Further evaluation required for Alternative D-1 and D-2 (Subsequent Increments).**

Alternative D-1 and D-2 (Applicable to the First Increment of these Alternatives only)

Table 6.4-1 compares the projected population contained in the current General Plans of the City and County covering the City's water service area to the population forecast prepared by AMBAG that was used in the development of the water demand study and which served as a foundation of the IWP. The projected growth in the general plans between 1990 and 2005 for the entire water service area was 13,337, compared to 13,999 in the water demand study. The difference between these figures amounts to less than one percent of the total population served. Therefore the Program is regarded as consistent with the local general plans regarding population growth.

Table 6.4-1
Comparison of Growth Parameters Analyzed in the Santa Cruz City General Plan, County General Plan, Capitola General Plan and 1998 Water Demand Investigation

JURISDICTION	PLANNING HORIZON	POPULATION			HOUSING[3]		
		1990	2005	GROWTH	1990	2005	GROWTH
City of Santa Cruz	2005	49,711	59,670	9,959	19,364	20,594 21,594	1,230 2,230
County[1]	2005	-	-	3,217	11,598	13,028	1.430
City of Capitola[2]	N/A	1,141	1,302	161	538	576	38
Total Water Service Area	**-**	**-**	**-**	**13,337**	**31,500**	**34,198** **35,198**	**2,698** **3,698**
Water Demand Study[4]	2005	79,985	93,984	13,999	-	35,055	-
Difference between General Plans and Demand Study		**-**	**-**	**(662)**	**-**	**(857)** **143**	**-**

Source: City of Santa Cruz 1992; Santa Cruz Planning Department 1993; Gary Fiske & Associates 2003; Maddaus 1998.

[1] *The population figures are for Live Oak (within Urban Services Line, USL) planning areas, from the Santa Cruz County General Plan and Local Coastal Program EIR (1993). The housing figures include Live Oak only (within the USL), and are based on the buildout of vacant land according to the 1994 General Plan's Low Residential Density Alternative (Alternative 2). Note that the total future units estimated for Live Oak differs in the 1993 EIR and the 1994 General Plan by 43 units. Soquel figures were not included because a large portion is outside of the service area, and inclusion of the values in the Santa Cruz County General Plan would overestimate the actual existing and projected housing units for the service area within unincorporated Santa Cruz County.. The 2005 figures shown are for buildout of these areas. No assumptions were made regarding the availability of infrastructure and the adequacy of public services for new development (Santa Cruz County 1994, pp. 4-65). The County future employment figure was not associated with a specific year, but is used in this table for reference purposes.*

[2] *No data are available for the portion of Capitola served by the City. Values are taken from 1998 Water Demand Study. Due to the small contribution of this region to the overall service area, the margin of error is not anticipated to be high.*

[3] *For the City of Santa Cruz, two values for housing units are provided. The low value reflects the potential units under the general plan; the high value is the State regional fair-share housing allocation (City of Santa Cruz General Plan 1992).*

[4] *Population projections and corresponding projections of water demand made in the Water Demand Investigation (Maddaus 1998) were based on City and County General Plan population projections.*

With respect to growth in housing, the figures used in the demand study were also consistent with estimates of housing units contained in local general plans. As such, the IWP is considered to be consistent with the adopted general plans and poses no impact. Therefore, the program is considered not to be growth inducing.

With regard to the first increment of Alternative D-2, the proposed program would provide a supplemental source of water for population growth that has already occurred in the mid-county area.

<u>Alternatives D-1 and D-2 (Applicable to Subsequent Increment of both Alternatives)</u>

The City of Santa Cruz is currently preparing an update to its General Plan. Accordingly, a determination of the Program's consistency with the next General Plan cannot be made before it has been finalized and approved by the City Council.

It is intended that expansion of the desalination plant will be based on the planned and approved growth, and tied to the timing of that growth. Once the next General Plan has been updated, project-level environmental review will be conducted and should enable a determination of consistency to be made between the Program and any future growth envisioned in the General Plan update.

With regard to Alternative D-2, any potential impacts of growth in the mid-County area related to consistency between the District’s water supply plans and the general plans of the County and the City of Capitola should be addressed and, if necessary, mitigated in the District’s water supply planning documents and accompanying EIR.

<u>Mitigation Measures</u> (for the subsequent increment of both Alternatives)

Project-level environmental review shall address the consistency between future stages of the proposed Program and any future growth envisioned in the General Plan update, with the requirement that any future expansion of the desalination plant or proposed change in operation is responsive to rather than built out ahead of planned growth.

Significance After Mitigation: Less than significant.

⌦ **Impact 6-4: Existing planning regulations and land use controls would be lessened with the program. No Impact for Alternatives D-1 and D-2 (First and Subsequent Increments)**

<u>Alternatives D-1 and D-2 (Applicable to First and Subsequent Increments of both Alternatives)</u>

The existing planning regulations described in Regulatory Framework above would not be affected by implementation of the proposed Program. The existing regulations are part of approved general plans and ordinances that have been adopted by local government land use authorities. The County urban service line and growth management system would remain in place. Any revisions or amendments to those regulations and controls would require a public process and the vote of the City Councils of Santa Cruz and Capitola or the County Board of Supervisors, and possibly a public election. Therefore, existing regulations would not be lessened with the provision of drought or supplemental supply for the City or a supplemental water supply to the District, and no impact involving growth inducement would occur under either alternative.

<u>Mitigation Measure</u>

None Required.

⌧ **Impact 6-5: The program would induce growth at the University. No impact for Alternatives D-1 and D-2 (First and Subsequent Increments).**

<u>Alternatives D-1 and D-2 (Applicable to First and Subsequent Increments of both Alternatives)</u>

As mentioned earlier, a new draft Long Range Development Plan (2005 LRDP) for the University has recently been completed and is undergoing CEQA review. The 2005 LRDP calls for a projected increase in student enrollment of 6,000 to approximately 21,000 by 2020, and increase of 1,800 in the number of faculty and staff to 5,900. The 2005 LRDP proposes a building program and a land use plan to support this projected growth, allowing 4.1 million gross square feet of additional academic and support space and housing, approximately double the current amount. (UCSC 2005).

Growth plans at the University are based on UCSC's aspirations to expand its academic, research, and professional programs, to increase its graduate student enrollment and to meet the projected higher education needs of California's population. The University is one of the primary forces driving population growth in the City service area and increased student enrollment is a major factor underlying the need for the proposed Program. While the University recognizes the importance of water supply to the growth of the region and is supportive of the City's efforts to ensure a reliable water supply, UCSC would move forward with its planning efforts with or without the proposed Program.

Implementation of either D-1 or D-2 therefore, would have no impact in terms of causing or fostering the University's planned growth. The impact is not applicable to the SqCWD.

<u>Mitigation Measure</u>

None required

⌧ **Impact 6-6: The Program would be operated within the City's service area in a way that would utilize intended drought reserve capacity to meet needs for ongoing growth, leaving the city vulnerable in the future. No Impact for Alternatives D-1 and D-2 (First Increment), Less than Significant for Alternatives D-1 and D-2 (Subsequent Increments) with EIR-identified mitigation.**

<u>Alternatives D-1 and D-2 (Applicable to First Increments of both Alternatives)</u>

For Alternative D-1, under normal water conditions, existing City water resources are adequate to meet system demand for the foreseeable future. No purpose would be served to use the Program for other than drought protection.

Under Alternative D-2, the water produced by the desalination facility would be used by Soquel Creek Water District, not the City, except under drought conditions. The amount of water delivered to Soquel Creek and priority of operation would be covered by an operations agreement, which would be subject to approval by the City Council and the Districts' Board of Directors and thereby would control how the plant is managed and funded.

For these reasons, no impact would occur under either alternative.

Mitigation Measure

None required

Alternatives D-1 and D-2 (Applicable to Subsequent Increments of both Alternatives)

As with the initial increment, the priority of the desalination plant in future years for Alternative D-1, is to provide drought protection for the City. According to the water system modeling conducted for the IWP, there also is the possibility that the plant may be needed on a year round basis at 1.25 mgd to accommodate future growth. The phasing of the desalination facility was designed with this flexibility in mind, although the exact point in time when such a need would arise is unknown.

As described above, additional environmental review will be required for any expansion of the desalination plant or proposed change in operation to ensure that the capacity and manner of operation of the plant is consistent with future population projections and City/County planning documents, and to ensure that development of additional water supply for Santa Cruz is responsive to rather than built out ahead of planned growth.

Under Alternative D-2, the water produced by the desalination facility would be used by both the Soquel Creek Water District and by the City. The amount of water delivered to Soquel Creek and priority of operation would be covered by an operations agreement, which would be subject to approval by the City Council and the Districts' Board of Directors and thereby control how the plant is managed and funded.

Mitigation Measures

Subsequent environmental review shall be required for any expansion of the desalination plant or proposed change in operation to ensure that the capacity and manner of operation of the plant is consistent with future population projections and updated City/County planning documents, and to ensure that development of additional water supply for Santa Cruz is responsive to rather than built out ahead of planned growth.

Significance After Mitigation: Less than significant.

6.5 CONCLUSION

In this chapter, per *CEQA Guidelines* Section 15126.2(d), the proposed Program was evaluated for its potential to directly or indirectly induce growth of population, economic development, or housing construction. The significance of growth impacts was considered against the following criteria:

- remove an obstacle to growth (CEQA Guidelines 15162.2(d)).
- bring water service to a geographic area where it is not now available.
- be inconsistent with adopted general plans concerning population or housing growth.
- lessen existing planning regulations and land use controls with the program.
- induce growth at the University.
- be operated within the City's service area in a way that would utilize intended drought reserve capacity to meet needs for ongoing growth, leaving the city vulnerable in the future.

For each criterion, four operation scenarios of the Proposed Program were considered – the first increments of Alternatives D-1 and D-2, and the subsequent increments of Alternatives D-1 and D-2. The findings are summarized below, in Table 6.5-1.

For the first increment of both alternatives, there is no impact with respect to growth inducement.

With respect to the subsequent increment of Alternative D-1, the analysis shows that the proposed Program potentially could induce growth. That is, if the City is unable to continue growing because of the limited capacity of its existing sources in normal water years, then the subsequent increments of desalination water could remove that obstacle. Future environmental analysis at the time a change in plant operation or expansion would be necessary to ensure that the development of additional water supply is responsive to planned growth. In addition, further evaluation will be required to assess impacts regarding consistency of the program with the next General Plan.

With respect to the first and subsequent increments of Alternative D-2, it would be speculative at this time to say if water supply will become a limiting factor or the limiting factor to population, economic, or housing growth in the mid-county region. Accordingly, it cannot be determined at this time whether the proposed Program would remove such an obstacle to growth. Any potential impacts of growth inducement in the mid-County area would be addressed and if necessary, mitigated, in the District's water supply planning documents and accompanying EIR.

Based on this evaluation, neither Alternative D-1 nor D-2 is distinctly different from one another in terms of their growth inducing impacts. It is most likely that the City will eventually be limited by the capacity of the existing water supply system and need a new source to allow for continued community growth and development. This possibility, however, is equally likely to occur under D-1 as under D-2. Therefore, there is no real distinction between the two alternatives with respect to growth inducement.

Table 6.5-1
Summary of all impact criteria reviewed for growth INDUCEMENT

IMPACT	ALTERNATIVE D-1, 2.5 MGD	ALTERNATIVE D-2, 2.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD	ALTERNATIVE D-1, 3.5 AND 4.5 MGD
Impact 6-1: The program would remove an obstacle to growth.	No Impact	No Impact	Further evaluation will be required.	To be addressed by SqCWD.
Impact 6-2: Water would be brought to a geographic area where it is not now available?	No Impact	No Impact	No Impact	No Impact
Impact 6-3: The program would be inconsistent with adopted general plans and other regional plans concerning growth.	No Impact	No Impact	Further evaluation will be required.	To be addressed by SqCWD.
Impact 6-4: Existing planning regulations and controls would be lessened with the Program.	No Impact	No Impact	No Impact	No Impact
Impact 6-5: The Program would induce growth at the University.	No Impact	Not Applicable to SqCWD	No Impact	Not Applicable to SqCWD
Impact 6-6: The Program would be operated within the City's service area in a way that would utilize intended drought reserve capacity to meet needs for ongoing growth.	No Impact	No Impact	Further evaluation will be required.	Further evaluation will be required.

REFERENCES

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Chapter 7 Cumulative Impacts

7.1 CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) ANALYSIS REQUIREMENTS

CEQA defines a cumulative impact as "an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts" (*CEQA Guidelines*, Section 15130[a][1]). The *CEQA Guidelines* require a discussion of cumulative impacts when the project's incremental effect is cumulatively considerable, as defined in Section 15065(c).[1] This analysis conforms to Section 15130 of the *Guidelines*, which also includes the following:

> (a) …Where a lead agency is examining a project with an incremental effect that is not "cumulatively considerable," a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.
>
> (1) …An EIR should not discuss impacts which do not result in part from the project evaluated in the EIR.
>
> (2) When the combined cumulative impact associated with the project's incremental effect and the effects of other projects is not significant, the EIR shall briefly indicate why the cumulative impact is not significant and is not discussed in further detail in the EIR. A lead agency shall identify facts and analysis supporting the lead agency's conclusion that the cumulative impact is less than significant.
>
> (3) An EIR may determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable and thus is not significant. A project's contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact. The lead agency shall identify facts and analysis supporting its conclusion that the contribution will be rendered less than cumulatively considerable.

The *CEQA Guidelines* identify two basic methods for establishing the cumulative environment in which the project is to be considered: either a list of past, present, and reasonably foreseeable future projects; or the use of adopted projections from a General Plan or other regional planning document (*CEQA Guidelines*, Section 15130[b][1]). This Draft EIR uses a list of projects compiled from local and regional agencies, as well as consultants working in the region.

The proposed Program could be implemented concurrently with other local projects, thus contributing to local and regional cumulative impacts. A distinction is made between local and

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[1] "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects, as defined in Section 15130.

regional impacts because the geographic context for cumulative effects differs among the issue areas. For example, the Monterey Bay Area is the regional context for marine resources and air quality. The drainages encompassing the proposed Program area constitute the regional context for surface water effects. For visual quality, the local environment is considered for cumulative effects.

7.2 LOCAL CUMULATIVE PROJECTS

Local development projects within the City's service area are listed in Table 7-1. This list of projects (hereafter referred to as cumulative projects) was compiled based on information from local and regional agencies as well as consultants working in the region and represents the present and future projects that are reasonably expected to occur within the study area. Relevant cumulative projects are those that would be constructed concurrently and within the same geographic scope as the proposed Program. Thus, the timing and proximity of cumulative projects are considered in determining cumulatively considerable impacts. However, the precise timeframes for implementation of many of the cumulative projects have not yet been identified. As described in Chapter 4, Program Description, construction of the desalination facility would take up to 34 months and could occur anytime between 2005 and 2010. Therefore, some of the cumulative projects could coincide with implementation of the desalination facility.

A number of cumulative transportation projects within the proposed Program area could be constructed concurrently with the proposed Program (see Table 7-2). Other cumulative transportation and public works projects could occur in the study area vicinity through the year 2010.

7.2.1 Notable Local Cumulative Projects

Several cumulative projects are located in the vicinity of the proposed desalination area sites (westside of Santa Cruz). If these cumulative projects are constructed simultaneously with the desalination plant, cumulative impacts could occur. These projects include the *UCSC Marine Science Campus Coastal Long Range Development Plan* (CLRDP) and The Home Depot. In addition, the Santa Cruz County Regional Transportation Commission (SCCRTC) plans are relevant to the proposed Alternative D-2 pipeline corridor.

UCSC Marine Science Campus CLRDP – Terrace Point Area

In 1999, the UC Regents purchased 54 acres immediately east of and adjacent to its previous holdings (including the 16-acre Long Marine Laboratory, and the 25-acre Younger Lagoon Reserve) (UCSC 2004). UCSC prepared the CLRDP to guide and control future development, land use, and resource protection at the Marine Science Campus through 2020. The CLRDP proposes the construction of new facilities totaling approximately 409,000 square feet (sf), and the removal of some existing development totaling approximately 31,244 sf. Specifically, the plan calls for the development of a marine research and education facility, outdoor research area, support facilities, support housing (including 80 apartments and/or townhouses, 10 visitor–overnight accommodations, 30 researcher housing rooms, and 2 caretaker replacement housing units). Five near-term projects

Table 7-1
Cumulative, Development Projects in the Proposed Program Vicinity

CUMULATIVE PROJECT	SIZE	USE	STATUS / SCHEDULE	RELATIONSHIP TO THE PROPOSED PROGRAM
Lipton Building Reuse The Home Depot Site	Convert 116,000 square feet of the existing 291,000-square foot building. Build an addition 34,000 square feet of new space and create a 36,300 square foot garden center)	Manufacturing, Retail Commercial, Office	Application on file at City Planning	Desalination plant area
UCSC Coastal Long Range Development Plan (CLRDP) (Marine Science Campus/Terrace Point)	409,000 square foot new construction	Marine research and education facility, outdoor research area, support facilities, support housing	Revised CLRDP and EIR in public review. Regents and California Coastal Commission review pending.	Desalination plant area
Texas Instruments Building Reuse (Potential UCSC acquisition)	176,000 square feet	University, Manufacturing, Commercial	UCSC has expressed intent to purchase	Desalination plant area
Nueva Vista	48 Multiple Family Units	Residential	Completed	Desalination plant area
UCSC Ranch View Terrace (Housing)	74 Single Family , 21 Multiple Family Apartments., & 2,370 square foot Community Center	Residential, University	CEQA review underway	On lower UCSC campus near treated water distribution pipeline – Corridor 2
UCSC Long Range Development Plan	Projected enrollment to 21,000 FTE; 4,1 million additional gross square feet	Residential, University	Planning Final LRDP completed December 2004 CEQA Assessment Spring 2005	All components
Almar Center Expansion	25,210 square feet	Commercial	Unknown	Treated water distribution pipeline – Corridor 2

Table 7-1 (Continued)
Cumulative, Development Projects in the Proposed Program Vicinity

CUMULATIVE PROJECT	SIZE	USE	STATUS / SCHEDULE	RELATIONSHIP TO THE PROPOSED PROGRAM
Cardiff/High Development	48 Single Room Occupancy, 4 Multiple Family & 1,800 square foot Commercial/Retail	Residential, Commercial, Retail	Unknown	Treated water distribution pipeline – Corridor 3
705 Woodrow (Library Expansion)	1,040 square feet	School	Proposed	Near Concentrate discharge pipeline – Corridor 4
2222 East Cliff Drive (Harbor Redevelopment)	2,325 square foot Commercial Retail 1,400 square foot Restaurant Expansion	Commercial, Restaurant	Underway	
121 Market	4 Single Family	Residential	Unknown	Near Alternative D-2 pipeline – Corridors 5 and 6
Branciforte Commons (Residential/Commercial)	5 Multiple Family & 48 Single Room Occupancy 1,000 square foot Commercial Office	Residential	Unknown	Alternative D-2 – Corridors 5 and 6
1266 Soquel (Townhomes)	9 Multiple Family	Residential	Unknown	Alternative D-2 pipelines
350 Ocean Street Apartments	Approximately 15 New Units	Residential	Unknown	Alternative d-2 pipelines

Sources: Rebagliati 2004; Swenson 2004; Nickel 2004; Carver 2004; Hall 2004; Yates 2004; Zigas 2004; Harris 2004; Berry 2004

Table 7-2
Local Cumulative Transportation and Public Works Projects

CUMULATIVE TRANSPORTATION AND PUBLIC WORKS PROJECTS UNDER CONSIDERATION	PROJECT STATUS / SCHEDULE	RELATIONSHIP TO IWP
Widen highway (Route 1/17 Widening for Merge Lanes)	If state funds are available, construction could begin in fall 2005 and be completed in fall 2008.	D-2 pipeline alignments
Widen highway (Highway 1 HOV Lane Widening Project)	Planning/construction would not occur after 2007.	D-2 pipeline alignments
Construct trail (Santa Cruz County Coastal Rail Trail)	Not anticipated for another 5 to 10 years.	D-2 pipeline alignment, Corridor 7 only
Retrofit bridge (Murray Street/Santa Cruz Harbor Bridge Earthquake Retrofit)	Project is proposed and partially designed. No schedule for completion is available at this time.	D-2 pipeline alignments
Underground utility (Mission Street Utility Undergrounding Project)	Ongoing. Completion estimated by early 2005. Phase One begins at Swift Street and proceeds toward Bay Street. This segment is anticipated to take approximately one year. Phase Two, from Bay Street to Chestnut Street.	D-1 pipeline alignments
Widen street (Bay Street, northern leg near Mission Street)	Requested for inclusion in Update of Regional Transportation Plan[1]	D-1 pipeline alignment
Add traffic light (intersection of Escalona Drive and Bay Street)	Requested for inclusion in Update of Regional Transportation Plan	D-1 pipeline alignment
Add protected left-turn lights to signal (Bay and High streets at the base of UCSC), and add dedicated right-turn lane (northbound High Street onto Coolidge Drive)	Requested for inclusion in Update of Regional Transportation Plan	D-1 pipeline alignment
Improve road and consider creating a roundabout (intersection of Mission, King/Union Streets)	Requested for inclusion in Update of Regional Transportation Plan	D-1 pipeline alignment
In the short term, prohibit left turns (Ocean Street onto Broadway), and in the long term, widen street and create a protected left-turn lane (Ocean Street)	Requested for inclusion in Update of Regional Transportation Plan	D-2 pipeline alignment

Table 7-2 (Continued)
Local Cumulative Transportation and Public Works Projects

CUMULATIVE TRANSPORTATION AND PUBLIC WORKS PROJECTS UNDER CONSIDERATION	PROJECT STATUS / SCHEDULE	RELATIONSHIP TO IWP
Add traffic light (intersection of Bay Street and West Cliff Drive)	Requested for inclusion in Update of Regional Transportation Plan	Intake pipeline vicinity
Add more left-turn lanes (intersection of Water and Ocean Streets)	Requested for inclusion in Update of Regional Transportation Plan	D-2 pipeline alignment
Add dedicated right-turn lane (Ocean Street onto San Lorenzo Boulevard)	Requested for inclusion in Update of Regional Transportation Plan	D-2 pipeline alignment
If improvements to Highway 1 and Highway 17 are not forthcoming, improve intersection (Ocean and Plymouth Street)	Requested for inclusion in Update of Regional Transportation Plan	D-2 pipeline alignment
Add traffic lights or widen street to reduce congestion (Soquel Avenue from Ocean View Avenue to Poplar Street)	Requested for inclusion in Update of Regional Transportation Plan	D-2 pipeline alignment
Add traffic light (intersection of Bay and California Streets)	Requested for inclusion in Update of Regional Transportation Plan	D-1 pipeline alignment
Create railroad crossing (intersection of Shaffer Road and the Southern Pacific rail line)	Requested for inclusion in Update of Regional Transportation Plan	Desalination area, near D-1 pipeline alignment
Add traffic light (intersection of Shaffer Road and Highway[1])	Requested for inclusion in Update of Regional Transportation Plan	Near desalination area, D-1 pipeline

Sources: Myers 2004; Plushnick 2004; Williamson 2004; Tanaka 2004; SCCRTC 2004a 2004b 2004c.

[1] *The City Council, by motion on January 20, 2004, accepted these projects on a prioritized list of roadway modifications and signal projects for inclusion in the Regional Transportation Plan Update being done by the Santa Cruz County Regional Transportation Commission.*

were identified to be constructed by 2010, although complete implementation of the CLRDP would not be expected until at least the year 2020. Near-term projects include a shared campus warehouse and laydown facility, 42 apartment/townhouse units, the United States Geologic Survey Western Coastal and Marine Geology Facility, the Monterey Bay Aquarium Sea Otter Research and Conservation Center, and the Center for Ocean Health Phase II facility. The CLRDP Draft EIR was published in January 2004, and was certified by the University of California Board of Regents on September 21, 2004. The Plan was also approved by the Regents on the same day. At the time of this Program EIR publication, the Coastal Commission has not yet adopted the CLRDP. One of the desalination plant areas under the proposed Program is within the Terrace Point Area covered by the

CLRDP. CLRDP. However, as the final location of the desalination plant has not been determined, the CLRDP does not include this water facility in its plans.

The Home Depot

The Home Depot has filed an application with the City of Santa Cruz Planning Department for the development of a full-size store and garden center at the site of the Lipton Building (2200 Delaware Avenue). "Plans include converting 116,000 sf of the existing 291,000-sf building. In addition, The Home Depot would build 34,000 sf of new space behind the building and create a 36,300-sf garden center. Harmony Foods, which occupies 160,000 sf of the building, would remain, though possibly in slightly reconfigured space" (Santa Cruz Sentinel 2004). Neither the implementation schedule nor further details about the project have been identified. The Lipton plant is located in the center of the Industrial Park Area, one of three potential desalination plant locations, identified by the proposed Program.

UCSC Ranch View Terrace Faculty and Staff Housing Project

The UCSC Ranch View Terrace Faculty and Staff Housing Project is located northeast of the study area. However, due to its significant size, it is discussed as a notable project. The Draft EIR for the project evaluates the environmental effects associated with the construction of 80 three- and four-bedroom for-sale houses, three rental units, and a community center (Burns 2004). The project is planned for a portion of the 25.5 acres of UCSC land designated as "Inclusion Area D" in UCSC's *Main Campus Long Range Development Plan* (LRDP 1988). Inclusion Area D is between UCSC's main entrance, arboretum, and farm. The project is proposed to be constructed on 13 acres in the northern portion of the inclusion area. The inclusion area's remaining acreage, situated between the housing development and High Street, would remain undeveloped. The main campus' LRDP, which provides a blueprint for campus growth, set aside several inclusion areas, including Area D, to accommodate nonacademic, university-related activities such as faculty and staff housing.

UCSC Long Range Development Plan – 2005-2020

UCSC is in the process of updating its 1988 LRDP. The document is intended to provide a comprehensive framework for the physical development of the UC Santa Cruz campus, in support of UCSC's academic, research, and public service mission through 2020. The 2005 LRDP proposes a building program and a land use plan to support the projected growth in campus population and to enable expanded and new program initiatives. The 2005 LRDP updates and supersedes the 1988 LRDP and plans for development sufficient to accommodate a projected increase in students to approximately 21,000 by 2020-21. This increase would exceed the student enrollment assumptions in the 1988 LRDP by 6,000 students. In conjunction with the increase in student enrollment and research activity, the number of faculty and staff at UC Santa Cruz is projected to increase by 1,800 to an estimated total of 5,900. The 2005 LRDP allows 4.1 million gross square feet of additional academic and support space and housing (UCSC 2005).

The LRDP is not an implementation plan for development but provides a building program and a land use map that will serve as a comprehensive planning framework for capital construction, infrastructure, and land use programs (UCSC 2004).. Each specific capital project proposed at the University will be analyzed individually for consistency with the 2005 LRDP and 2005 LRDP EIR. The 2005 LRDP will undergo environmental review as required under CEQA, with certification planned for late spring 2005. Following certification, the 2005 LRDP would then be adopted by the Regents of the University of California.

Caltrans/Santa Cruz County Regional Transportation Commission Projects

Highways 1/17 Widening for Merge Lanes, City of Santa Cruz

The California Department of Transportation (Caltrans) proposes to increase safety and operational deficiencies at the Highway 1/17 interchange by increasing the number of merge lanes along the Highway 1 and 17 corridor, near its intersection. The project area encompasses the segment of Highway 1 from near La Fonda Avenue west to the Highway 1/17 interchange, and from the interchange northward past Pasatiempo Avenue. Caltrans would add merge lanes to the connection between the northbound Highway 1 and northbound Highway 17, and to southbound Highway 1 through the 1/17 interchange. In addition, Caltrans would widen or replace existing bridge standards and install landscape along the highway corridor (SCCRTC 2004a). During construction, two lanes of traffic would be maintained in both directions during the daytime hours, with the exception of the Emiline off-ramp, which would be closed during the entire construction project (three years). Lane closures along the project area would occur sporadically throughout construction, for a week at a time during evening hours (Duazo 2004). If state funds are available, construction could begin in fall 2005 and be completed in fall 2008.

Highway 1 HOV Lane Widening Project

The SCCRTC, in partnership with Caltrans, proposes to add a high occupancy vehicle (HOV) lane in each direction of Highway 1 between Morrissey Boulevard and San Andreas/Larkin Valley Road as part of the Highway 1 HOV Lane Widening Project. In addition, the agencies are considering new pedestrian/bike overcrossings, ramp meters, soundwalls, and auxiliary lanes. The objectives of the project are to reduce congestion, encourage carpooling, expand express service, and improve safety. Final design of the proposed facility, right-of-way negotiations, and construction of the facility would occur after completion of the Final EIR, which is estimated for 2007 (SCCRTC 2004b).

Santa Cruz County Coastal Rail Trail

In August 1999, SCCRTC voted to pursue acquisition of the Santa Cruz Branch Rail Line right-of-way, which extends 31.8 miles from Davenport to Watsonville Junction (Pajaro) in Monterey County. The Coastal Rail Trail, a bicycle and pedestrian path adjacent to the Santa Cruz Branch Rail Line, is included in the corridor’s 15-year program of projects. In April 2002, the Commission completed environmental review for acquisition of the rail line. In April 2004, SCCRTC approved funding to construct an initial segment of the trail. SCCRTC is in the process of acquiring funding to purchase the railroad right-of-way. SCCRTC included a transportation sales tax measure (Measure

J) in the November 2004 ballot to fund a number transportation projects, including the construction of the coastal trail (SCCRTC 2004c). However, Measure J was not passed by the voters (Seals 2004).

The Santa Cruz Branch Rail Line right-of-way is generally 100 feet wide. However, in some sections, development of the trail may be constrained by the narrowness of the right-of-way or due to encroachment by surrounding uses. The project proposes to locate the trail adjacent to the rail line so as not to affect existing freight rail service, or preclude future passenger rail service. The trail would consist of safety features, fencing, lighting, crossing protections, and other amenities (SCCRT 2004c).

7.3 REGIONAL CUMULATIVE PROJECTS

Development of the Draft Integrated Water Plan (IWP) overlaps with other notable regional resource management and water supply development plans, including Soquel Creek Water District's *Integrated Resource Plan* and other proposed desalination facilities in the Monterey Bay National Marine Sanctuary (the Sanctuary). The proposed Program has the potential to add to cumulative impacts if constructed and operated in conjunction with these projects, as discussed below.

7.3.1 Soquel Creek Water District Integrated Resource Plan

In October 1997, Soquel Creek Water District (SqCWD) initiated a decision-making process for determining its water supply need and selecting the best alternative(s) to meet that need. This process, known as the *Integrated Resource Plan*, covers a 30-year period.

In addition to evaluating water conservation programs and savings, SqCWD is updating its groundwater model and assessing a range of options to augment groundwater supply. These projects include a surface diversion and conjunctive-use facility on Soquel Creek, desalination (with the City of Santa Cruz), and a recycled water/groundwater exchange program with the City of Watsonville and the Pajaro Valley Water Management Agency (PVWMA).

The Soquel Creek diversion would take water during winter months, only when flows are above in-stream fish flow requirements. That water would be treated and delivered to SqCWD customers and/or injected into the aquifer for storage and later use when environmental conditions do not allow direct stream diversion. This alternative would require construction of diversions and approximately 2.5 miles of pipelines (SqCWD 2004). SqCWD determined that the Soquel Creek diversion project had too many uncertainties and disadvantages and thus, is no longer under consideration.

The desalination option consists of participating in the City's desalination facility development.

Under the recycled water groundwater enhancement project, SqCWD would assist the City of Watsonville and PVWMA in funding the 4,000 acre-foot (afy) per-year wastewater recycling project at the Watsonville Wastewater Treatment Plant. The recycled water would replace groundwater that would otherwise be pumped to meet agricultural irrigation demands. In exchange, Watsonville would increase its total production (including inland groundwater pumping) by up to 2,000 afy to sell to

SqCWD. This alternative would require construction of approximately five miles of pipelines (SqCWD 2004).

7.3.2 Pajaro Valley Water Management Agency Basin Management Plan

PVWMA's *Revised Basin Management Plan* identifies a recommended alternative to balance the groundwater basin and eliminate seawater intrusion in the Pajaro Valley. The 2002 EIR projected that these improvements would be implemented by 2007. The recommended alternative includes the following elements:

- Completion of the Harkins Slough Project
- Water conservation efforts of 5,000 afy
- Completion of the remainder of the Coastal Distribution System
- Construction of an import water pipeline to convey 13,400 afy of Central Valley Project (CVP) water plus five supplemental wells
- Acquisition of 22,300 afy of CVP water (to allow reliable delivery of 13,400 afy)
- Development of out-of-basin banking for assigned CVP water
- Development of 4,000 afy of recycled water from the Watsonville Wastewater Treatment Plant
- Watershed management programs that would include water resources monitoring, water metering, nitrate management, wells management, and recharge area protection

7.3.3 Desalination Facilities in the Monterey Bay Region

Three small desalination plants currently operate in the Sanctuary. Duke Power Plant in Moss Landing contains a seawater distillation plant that produces nearly 0.5 million gallons per day (mgd) for use in its boiler tubes for the power production process. This facility uses power plant cooling water as the source for the desalination feed water. Concentrate is combined with discharged cooling water prior to disposal in the Bay. A sufficient volume of cooling water discharge is available to dilute the concentrate, thus minimizing salinity impacts (Damitz 2004).

The Marina Coast Water District in the city of Marina operates a plant with a 0.3-mgd capacity; the plant supplies about 13 percent of the city's annual municipal water consumption. This plant uses a beach well for intake water, and an injection well for discharging concentrate effluent. This facility was built in 1996 and will be renovated with new technologies in the near future.

The Monterey Bay Aquarium operates a small facility that provides about 0.04 mgd for maintenance purposes (i.e., flushing toilets). The saline concentrate discharge is blended with, and effectively diluted by, the water outfall from aquarium exhibits.

Although only three facilities currently operate in the Sanctuary, there have been a number of recent proposals for both private and public desalination plants. These facilities (shown in Table 7.3-1-2, are at some stage of consideration or planning in the Sanctuary region. It is uncertain whether these desalination facilities would be implemented at this time. These facilities range in size from less than 50,000 gallons per day (gpd) to 18 mgd. Table 7-3 lists the existing and proposed desalination facilities in the Sanctuary. Due to its size, the Moss Landing Desalination Plant is discussed below.

Moss Landing Desalination Plant

The largest facility under consideration within the Sanctuary boundary is the CAL-AM desalination facility (part of the *Carmel River Plan B Water Supply Plan*). As proposed, this new facility would be co-located at the Duke Energy site in Moss Landing and configured with the existing Moss Landing Power Plant system Units 6 and 7. The outgoing cooling water from the power plant would serve as the source of water for the desalination facility. Concentrate from the desalination process would be combined with the power plant's cooling water discharge prior to disposal into the Bay. A projected maximum production capacity of 21 mgd was evaluated in the *Carmel River Plan B*. This corresponds to an average production capacity of 10 mgd and an approximate annual yield of 10,730 afy, with the capacity to meet the associated maximum daily peak demands (Damitz 2004; Gaffney 2004; Feeney 2004).

7.4 POTENTIAL CUMULATIVE EFFECTS AND MITIGATION MEASURES

This section contains a discussion of potential cumulative effects resulting from implementation of the proposed IWP together with the cumulative projects described in Tables 7-1, 7-2, and 7-3. Cumulative impacts could occur if cumulative project construction takes place at the same time and in the same cumulative geographic context as development of the desalination facilities. Assuming that the plant would require up to 34 months of construction and be completed between 2008 and 2010, construction of these facilities could begin as early as 2005. Because the timeline for cumulative projects is not available, it is not known if construction would occur simultaneously, especially for those projects that would be located in the vicinity of the desalination plant.

7.4.1 Hydrology and Water Quality

The geographic context for cumulative surface water effects is the drainage area that encompasses the study area. The watersheds within the study area are identified in Section 5.1, Hydrology and Water Quality.

Erosion, Sedimentation, and Accidental Spills

Construction of cumulative projects could increase the potential for erosion, sedimentation and risk of accidental chemical spills, which could degrade stream water quality. The Regional Water Quality Control Board (RWQCB) requires acquisition of a General Permit for Storm Water Discharges from Construction Activity for projects that would disturb one or more acres of land. The permit would require the preparation and implementation of a stormwater pollution prevention plan (SWPPP); the SWPPP identifies best management practices (BMPs) that regulate runoff and discharge into waterways and storm drains. The City of Santa Cruz also requires BMPs as part of its Construction Site Storm Water Runoff Control Program; these BMPs are consistent with the state's General Permit. Cumulative impacts would be considered less than significant as cumulative projects would

Table 7-3
Regional Desalination Facilities Under Current Consideration

PLANT	LOCATION	PURPOSE	TECHNOLOGY	MAX. CAPACITY	FEED WATER	DISCHARGE	STATUS
Duke Energy	Moss Landing	Power plant (water used in boiler tubes)	Distillation	0.48 mgd	Pre-existing pipeline from ocean	Pipeline to ocean; blend with cooling water	Active
Marina Coast Water District	Marina	Domestic water supply	Reverse osmosis	0.3 mgd	Subsurface seawater well (beach)	Injection well (beach)	Active
Monterey Bay Aquarium	Monterey	Non potable aquarium and visitor use (toilets etc.)	Reverse osmosis	0.04 mgd	Pre-existing pipeline from ocean	Pipeline to ocean, blended with exhibit water outfall	Active
Fort Ord/Marina	Marina (expansion of operating plant)	Domestic water supply	Reverse osmosis	2.68 mgd	Subsurface seawater well (beach)	Subsurface injection well (beach)	Project EIR initiated
Cambria Community Services District	San Simeon	Domestic water supply	Reverse osmosis	0.5 mgd	Subsurface seawater well (beach)	Subsurface injection well (beach)	Plan being revised
Ocean View Plaza	Monterey	Private development	Reverse osmosis	0.05 mgd	Pipeline from ocean	Pipeline to ocean	FEIR certified by City of Monterey
Sand City	Sand City	Domestic water supply	Reverse osmosis	0.27 mgd	Subsurface brackish water well (aquifer near beach)	Horizontal well (aquifer near beach)	Preparation of Draft EIR
Monterey Peninsula Water Management District Carmel River Plan B	Sand City	Domestic water supply	Reverse osmosis	7.5 mgd	Subsurface seawater well (beach)	Unknown	Preliminary work on EIR in progress
CAL-AM Coastal Water Project	Moss Landing	Domestic water supply	Reverse osmosis	9 to 18 mgd	Pre-existing pipeline from ocean	Pre-existing pipeline to ocean	Plan being assessed
Montara Sanitary District	Montara	Domestic water supply	Reverse osmosis	Unknown	Unknown	Unknown	Being considered (preliminary)

Sources:: Damitz 2004; Gaffney 2004; and Feeney 20 be required to implement BMPs consistent with both the RWQCB's SWPPP and the City's Construction Site Storm Water Runoff Control Program. As described in Section 5.1, the proposed Program would require the preparation and implementation of a SWPPP (see Mitigation Measure 5.1-1a). No further discussion of this cumulative impact is required.

Desalination – Concentrate Discharge

The existing desalination facilities which discharge into MBNMS include Duke Energy, Marina Coast Water District, and Monterey Bay Aquarium and have a combined maximum capacity of approximately 0.82 mgd. As described in Section 7.3.3, concentrate from the 0.48 mgd Moss Landing desalination plant is combined with cooling water. The 0.3 mgd Marina Coast Water District discharges its concentrates through an injection well, and the 0.04 mgd Monterey Aquarium dilutes its concentrates with water outfall from aquarium exhibits. All concentrate discharges are diluted or injected into deep wells prior to discharge, and meet state requirements (SWRCB's Ocean Plan and relevant NPDES permits). As such, water quality throughout Monterey Bay and the Sanctuary from these sources would be adequate to promote a healthy marine environment, and cumulative impacts to water quality would be less than significant. The proposed Program would also comply with existing Ocean Plan and NPDES dilution requirements, as described in Section 5.1., Hydrology and Water Quality. Therefore, the proposed Program would not elevate cumulative water quality impacts to significant.

Pending Desalination Facilities

There is an additional production capacity of 29 mgd from desalination facilities which are pending regulatory review and approval. Because the proposed facilities are speculative, they are not included in this cumulative impacts analysis. If any of these projects move forward, they will require detailed environmental analysis and a consideration of cumulative impacts at that time.

Groundwater Storage and Saltwater Intrusion

The regional context for cumulative groundwater effects is the Purisima aquifer, as it is the source of groundwater for the City, SqCWD, the Central Water District and private well owners in the county. The City withdraws, on average, 5 percent of its water supply from the aquifer, and SqCWD withdraws nearly 70 percent of its water supply from the aquifer. The City intends to produce 2 mgd from groundwater sources during peak drought events, regardless of whether the proposed Program is implemented. This well field has been a vital component of the City's water supply system since its acquisition from the Beltz Water Company in 1964. The Beltz Treatment Plant was expanded from its original capacity of 1 mgd to 2 mgd in 1986. Well damage sustained in the 1989 Loma Prieta earthquake reduced well capacity to 1 mgd and was restored to 2 mgd in 2000. A project is planned to restore treatment capacity to a reliable 2 mgd in 2007.

The cumulative condition also includes SqCWD's net groundwater production and assumes that the SqCWD offset would occur regardless of the source of supplemental water. Cumulative groundwater effects also include private well owners. It is estimated that the total average annual pumping from the Purisima Formation by all pumpers (i.e., City of Santa Cruz, Soquel Creek Water District, and the Central Water District over the period from the early/mid 1960s to 2002; pumping from private wells is unrecorded) is over 1200 mgy (3,700 afy).

Several factors contribute to a lack of information on the adverse effects on the groundwater basin, including insufficient data to determine the sustainable yield of the basin and the lack of detailed pumping information from private users. As discussed under Alternative D-2 in Section 5.1, Hydrology and Water Quality, the provision of supplemental groundwater to the SqCWD would likely benefit the groundwater basin by allowing for its recharge during normal to wet years (through conjunctive-use by SqCWD during those times), even though the City would be pumping at 2 mgd during the peak season of drought years**.**

While the impact of operating the City's Live Oak well field has not changed over the last 30 years, increased groundwater use outside of the City service district during the same time period has created a potentially significant cumulative impact. As indicated by conditions developed over the last 10 years, additional pumping by privately owned inland wells has lowered the amount of offshore flow available for capture by the well field (Hopkins Groundwater Consultants, Inc. 2004). The absence of a comprehensive groundwater management agency, empowered to control production by government agencies and private well operators, leaves an opening for further depletion of the Purisima aquifer. Cumulative impacts associated with groundwater use by all pumpers, including the City, cannot be mitigated if an additional supply is not available and uncontrolled demand is allowed to exceed the natural balance of the aquifer system (Hopkins Groundwater Consultants, Inc. 2004).

Alternative D-1 does not provide additional supply to offset over-pumping by other groundwater users and consequently does not mitigate the present and future cumulative groundwater extraction impacts on the Purisima aquifer. The cumulative impacts to groundwater storage and saltwater intrusion of Alternative D-1 are therefore significant and unavoidable.

Alternative D-2 provides additional supply to offset pumping by SqCWD and also provides a contingency whereby the City can use up to 1.25 mgd year-round. Both water purveyors would be allowed continued use of existing groundwater supplies and would gain access to additional supply from the desalination facility. This alternative offers the greatest potential benefit to the groundwater basin by providing a supply to each major groundwater user, thus preventing the need to increase future use of the limited groundwater resources. Nevertheless, cumulative impacts would still occur due to ongoing production at historical rates by all pumpers in the Purisima aquifer. The cumulative impacts to regional groundwater storage and saltwater intrusion under Alternative D-2 are significant and unavoidable.

In addition to Mitigation Measures 5.1-6a through 5.1-6c, Mitigation Measure C-1 is proposed to reduce the City's incremental contribution to cumulatively significant impacts. However, with implementation of Measure C-1, cumulative impacts may still be significant and unavoidable.

While no information is available to determine region-wide groundwater pumping impacts associated with well interference, stream flow depletion, and subsidence, groundwater extraction from all pumpers could potentially result in cumulative effects. Section 5.2, Hydrology and Water Quality, describes these potential effects associated with the City's pumping activities.

Aquifer Drawdown

Operation of the Live Oak well field over the last 32 years has not significantly affected proximate wells or existing groundwater users. As calculated, at a well distance of 2,000 feet, a drawdown effect up to three feet under 1 mgd operation and up to six feet during 2 mgd operation could occur in the aquifer. The calculated drawdown values at the nearest SqCWD well are on the order of 1 to 2 feet under all proposed pumping conditions. Because these levels of interference drawdown are periodic, infrequent, and have been historically tolerable, the City's pumping would be considered less than significant, and thus its contribution to potentially significant cumulative impact is not considerable.

The City's well field is located at considerable distances from most sensitive surface water features (including Soquel Creek), and the primary component of produced groundwater from these features is offshore flow that would otherwise be discharged to the ocean. Based on study results, the drawdown amounts do not directly translate to reductions in stream flow. Groundwater pumping by the City would have a less than significant impact on surface waters, including coastal lagoons and estuaries. Therefore, its contribution to potentially significant cumulative impact is not considerable.

Subsidence

With respect to subsidence, because the magnitude of drawdown caused by the City's groundwater pumping is small, and the Purisima Formation is consolidated, the impact from City pumping is less than significant. Therefore, its contribution to potentially significant cumulative impact is not considerable.

Mitigation Measures

See Mitigation Measures 5.1-6a and 5.1-6c.

Mitigation Measure C-1: The City shall work with SqCWD and other public and private water users who produce water from the Purisima aquifer to establish a regional groundwater management agency. The agency shall be empowered to collect data and build a comprehensive basinwide database for equitable curtailment of use or expansion of supply through mutually funded projects.

7.4.2 Marine Resources

The geographic context for cumulative impacts to marine resources is Monterey Bay and the Monterey Bay National Marine Sanctuary. Power plants located in the area include Duke Energy's Moss Landing Power Plant. A number of desalination facilities are in operation or are being planned within the Monterey Bay Area (see Table 7-.3-1). Some of the existing and proposed facilities are or will be equipped with beach wells for seawater intake and concentrate discharge; beach wells in general reduce the potential for direct impingement and entrainment of marine organisms, as well as effects of concentrate discharge on these resources. However, existing and proposed surface water intakes and outfalls have a potential to result in cumulative impacts to marine resources in Monterey Bay.

Proposed Desalination in Region

A number of desalination projects propose to install or use existing open-surface-water intakes and discharges, as would be the case if desalination plants were co-located with existing power plants (e.g., Duke Energy, CAL-AM Coastal Water Project). Although there are potential benefits, co-location could also result in significant adverse effects if the power plant is shut down temporarily or permanently. Furthermore, the Coastal Commission indicates that "the once-through cooling systems of most coastal power plants are several decades old and do not reflect current understanding of environmental siting constraints, improved intake designs, or better understanding of the ecological effects of entrainment" (California Coastal Commission 2003). Because the proposed facilities are highly speculative, they are not included in this cumulative impacts analysis. If any these projects move forward, they will require detailed environmental analysis and a consideration of cumulative impacts at that time.

Existing Desalination Facilities

The only active desalination facilities in the project area are at the Moss Landing Power Plant, at Marina Coast Water District, and at the Monterey Bay Aquarium. The intake with the greatest potential to cause significant entrainment and impingement impacts is the Moss Landing Power Plant. New units were recently constructed with withdrawals of approximately 360 mgd of seawater near Elkhorn Slough. As part of the certification process for the changes to the Moss Landing Power Plant, the California Energy Commission required Duke Energy to perform a detailed study of the biological effects on marine organisms associated with the use of its intake. The study determined that entrainment by the Moss Landing Power Plant intake would kill 13 percent of the total larval organisms within the source water, with primary impacts to eight species of fish. This impact was determined to be significant, and Duke Energy was required to improve the intake with improved technology and provide $7 million to the Elkhorn Slough Foundation to restore habitat in the Elkhorn Slough. The significant impact of the power plant intake on the aquatic resources of Elkhorn Slough was thus mitigated.

The Marina Coast Water District desalination facility withdraws water from beach wells and thus does not cause entrainment and impingement impacts. The Monterey Bay Aquarium desalination facility uses only 0.04 mgd of seawater. This small amount of seawater withdrawal is unlikely to have significant adverse impacts. Therefore, cumulative impacts for the three existing desalination facilities are less than significant.

Proposed Desalination Facility at Santa Cruz

As discussed in the Chapter 4, Program Description, the City would design its intake to minimize adverse effects to marine resources, which would reduce its contribution to cumulative impacts. The intakes would consist of screens and baffles with a mesh size of approximately 0.1 inch. The maximum through-screen intake velocity would be 0.5 feet per second. In addition, the intakes would include an air scour system that would remove debris caught in or on the intake screen. The incremental contribution of the proposed Program to effects on marine resources from entrainment would be small. Further minimization of incremental effects would occur if the proposed plant would be operated only during peak-seasons of drought years (Alternative D-1). Therefore, the proposed Program would not elevate the cumulative impacts of impingement and entrainment to significant.

As discussed in Section 7.4.1, Hydrology and Water Quality, cumulative impacts associated with concentrate discharge into Monterey Bay would require compliance with all conditions set forth in the RWQCB's NPDES permit and the SWRCB's Ocean Plan. These conditions are intended to protect both the water quality of the Bay and the health of the Bay and Ocean's marine resources. Therefore, compliance with NPDES permits would ensure that cumulative impacts to marine resources from concentrate discharge would be less than significant.

7.4.3 Biological Resources

The geographic context for cumulative biological resource impacts includes the proposed Program study area as well as the watersheds in which the study area is located. Implementation of the cumulative projects would require the construction of facilities (structures and buildings). Depending on the locations of these facilities, sensitive biological habitat and associated special-status plants and wildlife could be temporarily affected or permanently removed, leading to significant cumulative impacts. The UCSC Marine Science Campus CLRDP EIR, published in January 2004 and certified by the Regents in September 2004, identified potential effects to biological resources; however, such effects could be mitigated to less than significant levels (UCSC 2004). There is insufficient data to characterize the potential effects on biological resources from other cumulative projects. Therefore, for the purposes of this analysis, cumulative impacts to biological resources could be considered potentially significant. As described in Section 5.4, Biological Resources, sensitive habitats and special-status species that could be adversely affected (directly or indirectly) by the proposed Program include, but are not limited to, wetlands, California red-legged frog, southwestern pond turtle, foothill yellow-legged frog, Ohlone tiger beetle, raptors, San Francisco dusky-footed woodrat, coastal steelhead, and the San Francisco popcorn flower. Actual effects to these resources resulting from the proposed Program have not yet been quantified, because protocol-level surveys have not yet been conducted. However, implementation of measures identified in Section 5.4, Biological Resources (e.g., preconstruction surveys, limitations on construction timing, revegetation, installation of appropriate flagging or fencing, etc.) would ensure that the proposed Program would reduce its incremental contribution to this potential cumulative effect to less than considerable.

7.4.4 Land Use, Planning, and Recreation

The geographic context for cumulative land use impacts includes the proposed Program study area and surrounding properties. Cumulative projects would generally be located within areas that are intended for development or improvement. In addition, they would be sited in areas that are compatible with existing and surrounding uses. Therefore, no significant cumulative impacts associated with the disruption or division of established land uses would occur.

The geographic context for cumulative recreation resource impacts includes the proposed Program study area and surrounding properties. Since the proposed Program would not result in any long-term increase use of recreational facilities that could lead to substantial physical deterioration or alteration, the cumulative context focuses on construction-related effects only. Simultaneous construction activities could temporarily affect surrounding recreation resources. However, due to each project's site-specific locations, it is unlikely that cumulative projects would directly affect the same recreational resources, and cumulative effects would be considered less than significant. The proposed Program is expected to directly affect recreation facilities at the proposed raw water pump station only, and indirectly affect access to recreation facilities during construction activities of the conveyance facilities. Mitigation measures identified in Section 5.3, Land Use, Planning, and Recreation, including provision of alternative access to recreational facilities, installation of signs to inform the public about temporary access closures, and restoration of recreational facilities would ensure that potential cumulative effects are not elevated to significant.

7.4.5 Air Quality

The North Central Coast Air Basin (NCCAB) is the geographic context for cumulative air quality impacts. As discussed in Section 5.5, Air Quality, the NCCAB is designated as a nonattainment transitional area for the state ozone standard and as a state nonattainment area for PM10 (particulate matters 10 microns or less in diameter). Cumulative air quality impacts in the NCCAB are addressed in the Monterey Bay Unified Air Pollution Control District's (MBUAPCD) *CEQA Air Quality Guidelines* (MBUAPCD 2004), which states that "projects which are not consistent with the AQMP [Air Quality Management Plan] have not been accommodated in the AQMP and will have a significant cumulative impact on regional air quality unless emissions are totally offset" (MBUAPCD 2002). The MBUAPCD uses the Association of Monterey Bay Area Governments' (AMBAG) projections in the preparation of the AQMP. The AMBAG projections are based on local and regional land use plans, such as city General Plans and County Comprehensive Plans, and therefore the AMBAG projections are based on the anticipated cumulative land use growth for the region. As cumulative projects have been accounted for in the AMBAG projections, they would also be consistent with AQMPs. Therefore, cumulative projects would not result in significant cumulative air quality impacts.

In addition, the UCSC Marine Science Campus CLRDP EIR evaluated cumulative effects associated with emissions of carbon monoxide[2]. It found that cumulative projects would not result in a cumulatively considerable significant air quality impact associated with traffic congestion on roadways and intersections generated by cumulative growth (UCSC 2004). Therefore, detailed discussion of cumulative air quality impacts is not required.

7.4.6 Noise

Stationary noise sources are not considered within a cumulative context, as noise generation is site-specific and would be addressed by compliance with the standards established in noise ordinances. Compliance with these standards would ensure that the cumulative projects would not result in cumulatively significant impacts. Therefore, detailed discussion of cumulative impacts associated with stationary noise sources is not required.

Cumulative noise impacts are related to traffic noise, and thus the geographic context includes the traffic network affected by the proposed Program. Traffic-related noise impacts on sensitive receptors occur when several thousand vehicles are on a roadway. Cumulative projects, including UCSC's Marine Science Campus and The Home Depot, would generate traffic during both construction and operation of these facilities. The UCSC Marine Science Campus CLRDP EIR evaluated cumulative noise impacts generated from traffic (based on projected 2020 traffic volumes). According to the CLRDP EIR, cumulative projects would not result in a cumulatively significant noise impact associated with increases in traffic volume, as noise levels would not exceed noise/land use compatibility thresholds (UCSC 2004). The proposed Program would result in about 60 construction-related and 30-operation related trips per day. As these trips would not contribute to significant cumulative traffic effects as described in Section 7.4.11, Traffic and Transportation (below), it would also not elevate cumulative traffic-related noise effects to significant levels.

As described in Section 7.4.11, below, if program construction activities occur simultaneously with Highway 1/17 improvements, then nighttime construction could occur (See Mitigation Measure C-2). *CEQA Guidelines* Section 15126.4(D) specifies that "if a mitigation measure would cause one or more significant effects in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed." Nighttime construction would result in significant noise effects along the affected roadways. This impact is discussed in Section 5.6, Noise.

7.4.7 Geology and Soils

The proposed Program's impacts related to geology, soils, and seismicity are site-specific in nature. However, as the entire Santa Cruz region is susceptible to earthquakes, there is a potential for

[2] The UCSC Marine Science Campus CLRDP EIR evaluates cumulative effects from implementation of other projects in conjunction with the CLRDP Project. The CLRDP EIR uses a hybrid approach in defining cumulative projects, and uses a list of projects to supplement and update the regional and City of Santa Cruz population and land use projections, especially those relative to the Santa Cruz west side area. However, the proposed IWP Program is not specifically identified in the CLRDP cumulative projects list.

seismic-related hazards (e.g., from ground shaking) to affect people and structures. Cumulative projects (including residential and commercial projects) could expose people to earthquake hazards if structures are not designed properly, thereby resulting in significant cumulative impacts. In California, all structures must comply with the design parameters of the Uniform Building Code and the California Building Code. Therefore, cumulative impacts would be reduced to less than significant and detailed discussion of cumulative impacts to geology and soils is not required.

7.4.8 Cultural Resources

The geographic context for cumulative cultural resource impacts is Santa Cruz County. Excavation activities associated with the cumulative projects could encounter known or unknown historic or prehistoric cultural resources, including Native American burials. Damage of these resources could contribute to a reduction of unique and important cultural resources. The sponsors of the cumulative projects are required to take appropriate measures to protect or preserve cultural resources affected by their projects. Surrounding projects would be required to abide by standard mitigation measures regarding the protection of culturally sensitive resources. Therefore, compliance with standard mitigation measures would ensure that potential cumulative impacts would be reduced to a less than significant level and no further discussion of cumulative impacts to cultural resources is required.

7.4.9 Visual Resources

The geographic context for cumulative visual impacts includes the viewshed that could be affected by the proposed Program, which consists of the western portion of the city of Santa Cruz (Westside area). There are no designated scenic routes, and public views of the study area are limited; however, the study area is visible from the hillside to the north. A number of proposed developments are located within this viewshed, including UCSC's Marine Science Campus at Terrace Point and The Home Depot.

The UCSC Marine Science Campus would result in a net development of nearly 530,000 square feet. Campus development would change the visual character of the primarily undeveloped property at Terrace Point. The Home Depot intends to develop a store in the Industrial Park site at and around the existing Lipton plant. As described above, The Home Depot would build an additional 34,000 square feet and create a 36,300-square-foot garden center. New facilities include structures, buildings, and paved areas. Development of the cumulative projects would transform the visual character of the Westside area. The UCSC Marine Science Campus CLRDP EIR evaluated cumulative impacts to visual resources. The impact of cumulative development on scenic vistas from the City's important viewpoints would be less than significant because it would either be screened by topography, vegetation, or other development; ocean and skyscape views would not be blocked (UCSC 2004). In addition, the cumulative impact on scenic view corridors and scenic vistas would similarly be less than significant as development within the Westside area is within the City's LCP and must comply with guidelines of the City of Santa Cruz General Plan Community Design Element

(UCSC 2004)[3]. All development on the remaining vacant parcels with in the Santa Cruz Westside study area would be required to adhere to relevant policies and would be subject to the City's design review process. Therefore, cumulative visual effects are considered less than significant and no further discussion of cumulative impacts to visual resources is required.

7.4.10 Hazards and Hazardous Materials

The cumulative projects could require the transport, storage, and use of chemicals, during either the construction or operational phase. If improperly stored or handled, accidental chemical spills could result in safety hazards to people and the environment that would constitute a potentially significant cumulative impact. All project sponsors with the potential to store and use hazardous materials must comply with applicable federal, state, and local laws and regulations, including preparation of relevant plans that address issues such as proper storage and emergency procedures in the event of a spill. The U.S. Department of Transportation regulates the transportation of hazardous materials and enforces guidelines to protect human and environmental health. Compliance with these regulations would ensure that the cumulative projects would not result in significant cumulative impacts. No further discussion of cumulative impacts associated with hazards and hazardous materials is required.

7.4.11 Traffic and Transportation

Cumulative impacts associated with traffic noise are generally covered under Section 7.4.6, Noise. The geographic context for cumulative traffic and transportation impacts includes the traffic network of western Santa Cruz, specifically the streets that provide access to the proposed desalination plant, as well as the area along and adjacent to the D-2 pipeline alignments. These roadways include, but are not limited to, Delaware Avenue, Mission Street, Swift Road, Highway 1, Soquel Avenue, Soquel Drive, and Capitola Avenue. Construction and operation of the cumulative projects, including UCSC's Marine Science Campus and The Home Depot, would increase the temporary traffic associated with construction activities and the long-term traffic associated with residents, employees, visitors, and shoppers. As described in the UCSC Marine Science Campus CLRDP EIR, the implementation of the CLRDP would result in short- (2010) and long-term (2020) traffic volume increases during the peak hours that would be significant and unavoidable (mitigation would not reduce potential effects) (UCSC 2004). In addition, the CLRDP EIR specified that a significant and unavoidable cumulative impact would result from regional development associated with the increase in AM and PM peak hour traffic at six study intersections in the short- and long-term. Therefore, cumulative traffic impacts would be significant. The proposed Program would result in an addition of about 60 trucks trips per day during the construction phase, and about 30 truck trips per day during the operation of the desalination facility (associated with workers commuting to and from work and some operations and maintenance trips to facility locations). Program-related construction truck trips, which would occur by 2010, would be limited to non-peak hours in specific areas to reduce traffic flow restrictions (see Mitigation Measure 5.12-1c in Section 5.12, Traffic and Transportation),

[3] Policies in the City's Design Element would ensure that a clearly defined urban boundary is maintained, tat the natural setting and scenic resources are protected, that new development is built to human scale, and that scenic views are protected.

and would be dispersed geographically throughout the study area. Therefore, construction-related truck trips would result in a less-than-considerable contribution to the cumulatively significant traffic impact.

Assuming 2003 traffic volumes, the proposed Program's 30 daily trips would constitute approximately one percent of total traffic on Delaware Avenue between Shaffer Road and Natural Bridges Drive[4]. It is expected that as traffic volumes increase through 2020, proposed Program operation-related trips would account to less than one percent of total traffic volume. Therefore, the addition of 30 daily operation-related trips would not constitute a considerable contribution to cumulatively significant traffic impact.

Other cumulative transportation projects, including Highways 1 and 17 improvements, could occur simultaneously with the proposed Program. The Highway 1/17 Widening for Merge Lanes will begin in fall 2005 if sufficient funding is available.

During highway construction activities, lane closures would occur at one off-ramp throughout the entire construction duration, and sporadically for a week at a time during the evening hours at other locations. Although Caltrans would maintain two lanes of traffic on the highway, construction activities could slow traffic, thus causing motorists to select surface street routes to bypass the affected highway segments. The traffic volume on Highway 1 between Soquel Drive and Morrissey Boulevard was 114,000 vehicles per day in 2002 (SCCRT 2004). Any vehicles diverted from the highway would add to the traffic volumes on Soquel Drive and Soquel Avenue (Alternative D-2 Corridors 5 and 6), both of which are designated as Countywide Congestion Management Roadways. Existing traffic volumes on these roadways can approach 24,000 vehicles per day (see Table 5.12-1 in Section 5.12, Traffic and Transportation). The increase in both construction and other traffic on these roadways could result in significant cumulative impacts if both projects occur simultaneously, particularly during the peak traffic hours. These impacts include traffic delays and congestion. As part of the traffic control plan for the proposed Program, Mitigation Measure 3.12-1c specifies the need to identify areas where construction would be limited to non-peak hours to reduce traffic flow restrictions. However, limitations on construction activities (for Alternatives D-2 Corridors 5 and 6) to non-peak hours may not be sufficient to reduce congestion and traffic delays if constructed concurrently with the Highway 1/17 Widening for Merge Lanes Project. Implementation of Mitigation Measures C-2 and C-3 would reduce the proposed Program's contribution to potential, significant cumulative traffic impacts to less than considerable.

Mitigation Measures

Mitigation Measure C-2: If construction of the proposed D-2 pipelines (Corridors 5 and 6) occurs in combination with the Highway 1/17 Widening for Merge Lanes project, the City shall consider conducting pipeline construction activities during nonpeak, nighttime hours only.

[4] The existing average weekday daily traffic volume for Delaware Avenue (Shaffer Road to Natural Bridges Drive) is 2,356 vehicles (Fehr & Peers Associates, Inc, 2003 as referenced in UCSC Marine Science Campus CLRDP EIR, 2004).

Mitigation Measure C-3: If construction of the Highway 1/17 Widening for Merged Lanes project occurs simultaneously with the proposed Program, the City shall coordinate with Caltrans to ensure that the construction schedule is timed to reduce transportation-related impacts to surface streets.

Significance After Mitigation: Less than Significant.

7.4.12 Energy

The geographic context for cumulative energy impacts is the western United States, as California's electricity supply system is integrated with the supply system for the western region of the country. Cumulative projects would consume energy (in the form of electricity) primarily during the operational phase (lighting, heating, and treatment processes of other desalination facilities). Desalination facilities, in general, consume large amounts of electricity.

The Desalination Task Force (DTF) concluded in its *Energy Options White Paper* (DTF 2003) that the electricity demand of the proposed desalination plants identified in its *Desalination Issues Assessment Report*[5] (which includes the City's proposed desalination facility and other facilities along the California coast) would not significantly affect the state's electricity supply systems. The operation of the proposed desalination facilities would consume 1,000 gigawatts per year (based on 2.5 mgd), which would be less than one-half of 1 percent of California's total energy use (DTF 2003b)[6]. This energy consumption would not be significant. Adequate capacity is expected in the next three to four years to meet electricity demand, although there is uncertainty regarding the adequacy of generation capacity during peak demand hours on summer afternoons beyond that timeframe (DTF 2003b). In addition, reserve margins during peak hours are expected to decrease according to the California Energy Commission's current forecasts. "Designing plants that would produce the desired amount of water, while operating less than 24 hours per day" can be considered a method to reduce energy use (DTF 2003b).

It should be noted that of the desalination facilities evaluated by DTF, 12 desalination facilities are known to exist, although not all of them are active. Another 21 projects are classified as proposed and are at various stages of development. It is uncertain which of these plants would be implemented, and plant operations schedules have not yet been determined for any of the proposed desalination projects. As such, it would be speculative to assume that all proposed desalination facilities would be implemented. However, the proposed Program in conjunction with other desalination projects would increase demand for electricity and natural gas. In some cases, including for the proposed

5 The *Draft Desalination Issues Assessment Report,* published by the Desalination Task Force on May 21, 2003, identifies existing and proposed desalination facilities along the California coast. Twelve desalination facilities are known to exist, although not all of them are active. Another 21 projects are classified as proposed; these are at various stages of development.

6 As indicated in the Desalination Task Force's *Energy Options White Paper* (2003), the energy use estimates are based on the initially expected energy requirements of the new Tampa Bay desalination facility in Florida, with adjustments for the salinity of the water along the California coast. The Tampa Bay facility is currently having water fouling problems; rectifying the situation may require additional energy use during the pretreatment of the water. Therefore, the energy use estimated in the *White Paper* may be based on overly optimistic forecasts of the energy required for seawater desalination (DTF, 2003).

Program, energy recovery devices would be implemented to reduce overall energy consumption at individual plants, thereby reducing overall demand. The increased demand would not necessarily result in the wasteful, inefficient, or unnecessary consumption of energy. Therefore, cumulative impacts associated with energy consumption would be less than significant.

7.4.13 Public Services

There are no cumulative impacts for public service.

7.5 ONGOING PLANNING ISSUES

Section 3.7 identified a series of ongoing projects and programs facing the City over its existing sources, each with independent utility, any one of which potentially could lead to some loss of supply in the future. As indicated, it is uncertain to what extent and which supplies might be impacted at the time of this EIR's preparation. The ongoing planning issues include the following projects:

- City of Santa Cruz Section 10 Permit Program
- North Coast System rehabilitation Project
- Water Rights Conformance Proposal
- Felton Diversion Water Rights Time Extension Project

These projects would not result in any physical change to either Alternative D-1or D-2 as outlined in the Program Description and therefore would not change the findings with respect to regional or local cumulative impacts. However, should any of these projects or programs lead to a loss of supply it could force the City to consider a change in the timing with respect to the next (subsequent) increment of desalination capacity. As indicated earlier, additional environmental review would be required for any expansion or proposed change in operation.

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Chapter 8 Alternatives to the Proposed Program

8.1 INTRODUCTION

8.1.1 CEQA Framework and Proposed Alternatives

In accordance with *CEQA Guidelines* Section 15126.6(a), "an EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." Alternatives that avoid or substantially reduce significant impacts are considered, even if such alternatives would impede to some degree the attainment of project objectives, or would be more costly (*CEQA Guidelines* Section 15126.6[b]).

This chapter evaluates alternatives to the Program, which are variants of the proposed Program that provide other approaches to achieving the basic Program objectives. Other than the No Program Alternative, the other two alternatives are differentiated primarily by the curtailment level and the size of the desalination plant. They provide two approaches to the management of water supply and demand, particularly during drought years.

- **No Program Alternative.** The No Program Alternative assumes the continuation of existing conditions within the City's service area. Water would continue to be supplied by the existing surface and ground water sources, the currently implemented conservation program would continue, and no supplemental supply would be developed at this time. For this reason, it would be unlikely that peak-year demands during drought years would be met and thus customers would be required to curtail to a level as high as 45 percent. The conservation program, which is currently being implemented, would continue.

- **No Curtailment Alternative.** This alternative is a variation of Program Alternatives D-1 and D-2. It would increase the size of the desalination facility to a future size of 8 mgd such that water production would have the potential to increase during drought years and no curtailment (0 percent) would be required of City customers. The conservation program, which is currently being implemented, would continue.

- **High Curtailment Alternative.** This alternative is also a variation of Program Alternatives D-1 and D-2. It would decrease desalination facility sizing to a future size of 4 mgd, but require a higher level of curtailment (25 percent) by City customers during drought years. The conservation program, which is currently being implemented, would continue.

This chapter evaluates the relative impacts of the alternatives to the Program. The environmentally superior alternative is identified per *CEQA Guidelines* Section 15126.6(e)(2), which states that, "if the environmentally superior alternative is the 'no project [No Program]' alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives."

8.1.2 Program Objectives

In accordance with the *CEQA Guidelines*, the alternatives considered in this chapter include only those that could (1) accomplish most of the basic objectives of the project, and (2) avoid or substantially lessen one or more of the significant effects of the Program. The IWP objectives are to: (1) reduce near-term drought shortages, and (2) provide a reliable supply that meets long-term needs while ensuring protection of public health and safety (Gary Fiske & Associates 2003). The near-term goal would reduce the level of curtailment needed in a 1976-77 type drought in excess of 40 percent down to no more than 25 percent, while the long-term goal would maintain that same level of drought protection and provide supply for planned growth through the year 2030.

8.2 ALTERNATIVES TO THE PROGRAM

8.2.1 Introduction

The *Integrated Water Plan* (IWP) evaluated a variety of scenarios to meet short- and long-term water demands within the City's service area. The IWP process is described in Chapter 4, Program Description, of this Draft EIR. The IWP recommended carrying forward two operational scenarios for evaluation (Alternatives D-1 and D-2); these alternatives are evaluated in Chapter 5 of this EIR and are not considered alternatives to the Program and therefore are not evaluated in this chapter. Table 8-1 is adapted from the IWP and illustrates the water supply additions necessary for each desalination-based alternative discussed in this Draft EIR. The proposed increments of additional supply are necessary to meet the projected shortfalls and specified curtailment levels over the program planning period.

Table 8-1
Supplemental Water Additions Over Program Planning Period

STRATEGY	2005	2009	2015	2020	2025	TOTAL
	PRODUCTION (MGD)					
Alternative D-1 or D-2 (Proposed Program) Curtailment – 15 percent 2.5-mgd plant (future 4.5 mgd)	None	2.5	1.0	None	1.0	**4.5**
No Program Alternative	None	None	None	None	None	**None**
No Curtailment Alternative Curtailment – 0 percent 5-mgd plant (future 8 mgd)	None	5.0	1.0	1.0	1.0	**8.0**
High Curtailment Alternative Curtailment – 25 percent 2-mgd plant (future 4 mgd)	None	2.0	1.0	None	1.0	**4.0**

Source: Gary Fiske & Associates, 2003

Note: The near-term horizon is defined as 2005, which corresponds with the city of Santa Cruz's adopted General Plan. However, based on actual population to date, the LWP estimated the General Plan's projected 2005 population would not be reached until 2009.

The No Curtailment and High Curtailment Alternatives would require the same types of facilities as those identified for the proposed Program, although the sizing would differ. Although the precise sizes (footprint of the desalination plant, diameter of the pipelines) of the facilities have not yet been determined, a general description can be provided. The facilities under the No Curtailment Alternative would be smaller in size than the proposed Program. The High Curtailment Alternative would have slightly larger facilities. As with the proposed Program, facilities associated with the alternatives could be located at any one of the proposed areas or along any one of the proposed alignments. However, as these locations are considered part of the proposed Program, they are not evaluated in this chapter but in Chapter 5. The No Program Alternative would not require any of the facilities identified for the proposed Program.

All desalination programs have the potential to meet the proposed Program objectives. The No Program Alternative would not meet the program objectives.

8.2.2 No Program Alternative

Description

The No Program Alternative calls for the continuation of the current water supply practices and facilities. No new water supply would be developed at this time, and existing operations would not be modified. Distribution system upgrades and maintenance would continue, as needed, to minimize water-line leaks and losses. In addition, the City would continue to operate the Beltz Wells at 1 mgd during normal and wet years, with the capacity to produce up to 2 mgd of groundwater during drought years.

Under normal water conditions, three of the four major sources of water supply (North Coast sources, San Lorenzo River, and Live Oak wells) are presently utilized at maximum capacity for a significant portion of the year (City of Santa Cruz Water Department, 2004). Loch Lomond Reservoir is typically used in the summer and fall months, when the flows in the coastal and river sources drop off and additional supply is needed to meet higher daily demands in the peak season. Full use of the reservoir is limited by existing water rights and the need to reserve water in the event of drought. During critically dry years or multi-year droughts, the combination of very low surface flows in the coastal and river sources and depleted storage in Loch Lomond Reservoir reduces available supply to a level that cannot support average dry-season demands.

As described in the IWP, “the City’s water supply system is grossly inadequate to meet current demand under drought conditions. With current supplies and facilities, if a drought comparable to the 1976-77 event occurred today, the City would experience a 45 percent peak-season shortage in the second year of that event. This compares to a maximum shortage of approximately 30 percent that was experienced in the 1976-77 drought” (Gary Fiske & Associates, 2003). It is expected that the higher the existing demand for water, the greater the potential shortfall during a future drought.

Table 8-2 illustrates the probability of water shortages occurring over the planning horizon. The chance of various shortfalls increases over time if no new water supply is developed. For example, the likelihood of a serious drought (30 percent or more shortage magnitude) increases from 8 percent in the next 5 years to 16 percent in 10 years, and increases to 40 percent in the next 30 years if no action is taken. The probability of mild to moderate shortages, as noted above, could exceed 90 percent in 30 years.

Table 8-2
Relationship of Water Shortages with Various Recurrence Intervals to the Probability Of Occurrence Over Time

SHORTAGE MAGNITUDE	RECURRENCE INTERVAL	PERCENT PROBABILITY OF OCCURRENCE OVER TIME:			
		5 YEARS	10 YEARS	20 YEARS	30 YEARS
10% or more	7 in 59	47	72	92	98
20% or more	4 in 59	30	51	76	88
30% or more	1 in 59	8	16	29	40

Source: City of Santa Cruz Water Department, 2004

By the end of the planning period, if no action is taken, supply shortages may extend beyond the peak season of drought years, including nondrought years. The IWP projects that, by 2030, there would be a 90 percent likelihood of some level of curtailment during average years under a No Program Alternative (Gary Fiske & Associates, 2003).

Under the No Program Alternative, when there is not enough water supply to meet customer demand, water use by customers would be curtailed. Such curtailments would typically occur during the May–October "peak season," which is the time of year when stream flow and groundwater levels are lowest and demands are highest. Curtailment during drought events would occur in accordance with the rules and regulations governing the use of water during a water supply shortage, as contained in the City's Ordinance 92-10 (see Chapter 4, Program Description). The drought emergency ordinance is based on a four-stage approach; the response varies from voluntary use restrictions to mandatory rationing and includes a set of associated penalties. A conservation alert is initiated during a minimal shortage (5 percent). Mandatory restrictions are initiated when a moderate shortage occurs (13–19 percent). Limited or residential rationing is instituted in a serious shortage (20-38%). Full rationing would be required during a severe shortage (39 percent or greater).

The allocation of water among different customer categories in a drought is based on the classification of end uses into three priorities, in accordance with State Water Code:

1. **Health and safety**. This is the highest priority use. All residential interior and non-residential domestic and sanitary uses are assumed to fall under this priority, as is all usage at the wastewater treatment plant.

2. **Business**. This second priority use includes all usage that is related to commercial activity in the city. All non-sanitary uses in the business class are assigned this priority, as are all usage by the agriculture, industrial, golf, municipal, and miscellaneous classes of service.

3. **Outdoor irrigation**. This lowest priority use includes all outdoor usage in the single family, multi-family, University of California, and large landscape classes.

Under the worst case hydrologic conditions (i.e., those that occurred in 1977), the expected peak-season shortage is projected to be about 45 percent. Table 8-3 below shows the likely curtailment level that would be needed for each major customer group to achieve a system-wide 45-percent cutback. Health and safety uses would be reduced by 25 percent. Business uses would be reduced by 30 percent. Outdoor irrigation, under such dire circumstances, would likely be prohibited altogether.

Table 8-3
Peak Season Cutbacks in a 45% Water Shortage

CUSTOMER CLASS	PEAK SEASON CUTBACK APRIL-OCTOBER
Single Family Residential	50%
Multi-Family Residential	45%
Business	30%
Industry	30%
University of California	45%
Municipal	100%
Irrigation	100%

At some point in the future, if the No Program Alternative is chosen, then an additional water supply would be imperative for the city to meet the needs of its existing as well as new customers. New investigations would have to be initiated to evaluate the feasibility of developing supplemental water sources, with the potential that the work completed in this last decade would need to be repeated.

Environmental Evaluation

Under the No Program Alternative, conservation measures would continue to be implemented; however, the City would not institute a cap on the curtailment level or develop a new water supply. Conservation would reduce water demand minimally, but would not protect the public from major water cutbacks during droughts or provide a safe and reliable, near- and long-term water supply. As discussed above, the peak-season shortage is expected to be 45 percent under the worst historical hydrologic conditions.

The water system would continue to operate under present conditions and would be prioritized in the order of surface and ground water sources. Up to 2 mgd of groundwater would be pumped during the peak seasons of drought years, as would be the case with or without the proposed Program. The effects of groundwater production during a drought would be similar to those described under Alternative D-1 for the proposed Program (see Section 5.1, Hydrology and Water Quality).

In addition to the inconveniences and hardships caused by indoor restrictions, residential uses would be affected by the potential loss of turf, intensively gardened areas, and valuable plants due to outdoor rationing in drought years (Gary Fiske & Associates, 2001). Water rationing would lead to the degradation of the visual quality of landscaped areas, particularly under the critical and extreme curtailment levels, when water for large landscapes would be curtailed completely (100 percent). Under severe to extreme shortage conditions, customers would have to implement water conservation measures to stay within their ration, including using gray water for irrigation and toilet flushing, taking shorter showers, and going offsite for certain activities, including laundry, car washing, and potentially showering. Rationing allotments would decrease as the shortage magnitude increases, thereby exacerbating the situation.

Table 8-4 summarizes expected conditions under the severe to extreme shortage scenarios for residential users, as provided in the *Water Curtailment Study*.

Table 8-4
Expected Occurrences Under Severe, Critical, and Extreme Shortages

SEVERE SHORTAGE (40% PEAK-SEASON CURTAILMENT)	CRITICAL SHORTAGE (50% PEAK-SEASON CURTAILMENT)	EXTREME SHORTAGE (60% PEAK-SEASON CURTAILMENT)
Turf and intensively gardened areas would generally be sacrificed. Many trees and shrubs in large landscapes would be lost. Short showers / unflushed toilets becoming the norm. Some would use of gray water for toilet flushing and outdoor watering. Investments in water-efficient fixtures or appliances would increase. Laundry rooms and pools would close. Some would wash cars, do laundry, or shower offsite. Some would use paper/plastic products to minimize dishwashing.	City would severely limit or ban outdoor watering. Turf and intensively gardened areas would be lost, as would a significant percentage of trees and shrubs. Indoor water use would be reduced. Toilet flushing for toilet flushing only. Shortened showers would be normal. Baths would be less frequent. Less laundry would be washed. Sewer drain line clogging / need for more plumbing services. Bath, dish, laundry water would be recycled for toilet flushing or minimal landscape maintenance. Water would be purchased from outside.	All outdoor watering would cease – more loss of valuable trees and shrubs. Urine would no longer be flushed. Showers would be minimal. Cooking water would frequently be saved for reuse elsewhere. Water would be collected wherever possible, including washer rinse water. Use of bottled water commonplace. The City would install flow restrictors and shut-offs.

Source: Gary Fiske & Associates, 2001

For a description of the expected social and economic impacts of water shortages in Santa Cruz, refer to the *Water Curtailment Study* (Gary Fiske & Associates, 2001). Effects to commercial and industrial customers are not discussed herein because they consist of primarily social and economic effects associated with loss of business, potential layoffs, and business closures.

The loss of aesthetic value of landscaping associated with three levels of outdoor water curtailments (30, 65, and 100 percent) was evaluated by Barrie Coate and Associates (in Gary Fiske & Associates, 2001). An outdoor curtailment of 65–100 percent would correspond to an overall system shortage of approximately 30–60 percent (the effects of outdoor curtailment are evaluated in Section 5.10, Visual Quality of this Draft EIR). The predicted impact on residential landscape value associated with a 65 percent curtailment would be severe, with the greatest impact on turf and intensively gardened areas (50 to 59 percent loss, respectively); a 25 percent loss of value would be expected for shrubs, and 22 percent loss of value for trees. Severe losses in landscape would occur for the 100 percent outdoor curtailment scenario. Turf, intensively gardened areas, trees, and shrubs, would experience a loss of value of 82, 80, 38, and 43 percent, respectively. The above values are based on average losses within several census tracts evaluated. Depending on the type of vegetation, some residential landscapes could lose 100 percent of their value. For large landscape areas, significant loss in value would be anticipated under the two curtailment scenarios. Average percent loss in value for the 65 and 100 percent outdoor curtailment would range from 30 to 65 percent and from 60 to 100 percent, respectively.

Under the No Program Alternative, no new water supply would be developed; thus, the short-term impacts associated with construction of the desalination facility would not occur, including disturbance to sensitive receptors from noise, dust, truck traffic, and effects to biological resources, surface water quality, and visual quality. Under this alternative, long-term operational impacts would also not occur, including disturbance to surrounding sensitive receptors from operation of pumps, energy consumption, effects to marine resources from impingement and entrainment, and changes in the visual character of the region.

Even with the City’s extensive conservation programs, water supply shortages would continue throughout the planning period. Under such a scenario, it is expected that the rate of planned growth would be slowed or restricted within the City’s service area. Without the provision of near- and long-term water supply, the City of Santa Cruz and Santa Cruz County would not achieve their fair-share housing goals, and UCSC would not be able to expand to its size in accordance with its current (1988) and planned (2005) existing and future Long Range Development Plans. Not only would the affected jurisdictions have a water shortage problem, but a housing deficit could lead to other social and economic effects. The lack of water could compel private owners to install additional groundwater wells, thereby increasing the overall use of the groundwater basin, with potential adverse consequences to the aquifer.

Relationship to Program Objectives

While the No Program Alternative could be considered environmentally superior because no construction and operation impacts would occur, it would neither reduce drought-year water shortages nor provide a safe and reliable, long-term water supply for the City’s service area. This alternative would therefore not meet the principal objectives of the proposed Program.

8.2.3 No Curtailment Alternative

Alternative Description

The No Curtailment Alternative is equivalent to Alternative D-1, Profile 1 in the IWP and would consist of zero curtailment and development of a 5-mgd desalination plant that is expandable to 8 mgd. This alternative is similar to the proposed Program, Alternative D-1, except that the capacity of the desalination facility is increased to allow a curtailment level of zero. This alternative would involve the construction of a 5-mgd seawater desalination facility (with space to expand to 8 mgd) consisting of an open-water intake, conveyance and distribution system, treatment plant, and concentrate disposal system that connects to the City's existing wastewater system. The footprint accommodating the desalination facility would be larger than the three-acre site under the proposed Program, and pipeline diameters would be larger to accommodate increase flow.

This alternative would satisfy the City's current drought shortfalls and future demand without any curtailments or restrictions on water use. Expansion of the initial 5-mgd desalination plant would be based on the actual timing and amount of growth, consistent with adopted projections of local and regional jurisdictions. Future plant size could ultimately reach 8 mgd if the City's water demand continues as projected. Incremental expansion of the facility would require additional environmental review.

The operational frequency of the desalination facility under the No Curtailment Alternative would be similar to that of the proposed Program, described in Table 4-5 and 4-6 of the Program Description. For the near-term, the plant would be operated to meet the City's drought demands. In the long-term, it would also be used to meet the City's need for a reliable water supply. However, to ensure zero curtailment, more water would be produced during the drought years compared to the proposed Program. In the near-term, that translates to an increase of 2.5 mgd (from the proposed Program) to 5.0 mgd. In the long-term, that would be an increase of 3.5 mgd (from the proposed Program) to 8.0 mgd.

The D-2 operational scenario could also be applied to this alternative, described in Tables 4-5 and 4-6 in the Program Description. Alternative D-2 would allow for the provision of water to Soquel Creek Water District. During drought occurrences, the City would operate the plant for its needs and additional water, if any, would be provided to SqCWD. During nondrought years, water would be provided to SqCWD to meet its demands and to recharge the groundwater aquifer. The precise quantity of water provided to SqCWD would be specified in a Joint Operations Agreement between the two agencies, but would not likely to be more than would be provided under the proposed Program. Provision of water to SqCWD would not exceed the sum of the forecasted demand (consistent with each jurisdictions' projections) and that needed for conjunctive use (refer to Chapter 6, Growth Inducement and Secondary Effects of Growth).

Environmental Evaluation

The water system would be operated following the same priorities; demands would be met first with surface water, followed by groundwater. Up to 2 mgd of groundwater would be pumped during peak seasons of drought years, which would be the case with or without the proposed Program. The effects of groundwater production during a drought would be similar to those described for the proposed Program (see Section 5.1, Hydrology and Water Quality).

Implementation of this alternative would ensure that, under the most-severe drought scenario (e.g., 1976–77 hydrologic conditions), water would be available to the City's customers such that no curtailment would be required. Under such a condition, the water shortage response and penalties under Ordinance 92-10 would not be applicable. As outdoor irrigation would not be cut back, no potential effects to landscaping would occur, and the visual quality of public and private properties would not be affected.

The No Curtailment Alternative would require a larger footprint to accommodate the larger plant facility, as well as larger-diameter pipes for the conveyance of water and concentrate. Therefore, construction-related activities under this alternative would be similar to, but more intensive than, those identified for the proposed Program (see Chapter 5). For example, larger disturbed areas would result in increased dust generation (from more grading), wider area of road closures (to accommodate larger-diameter pipes), and increased potential for water quality degradation or effects to biological resources. However, such impacts would be temporary and could be reduced to less-than-significant levels with the implementation of mitigation measures identified in this Draft EIR.

The types of operational impacts would also be similar to those described for the proposed Program, with the exception that potential impacts could be more intense in certain issue areas, such as marine resources. The level of impacts associated with the 5-mgd facility would generally be similar for an expanded 4.5-mgd facility under the proposed Program. However, an 8-mgd facility would require nearly twice the amount of seawater intake volume and energy consumption of the proposed Program. An increase in the intake volume could increase the potential for impingement and entrainment, even though the facility would be designed with screens and an air scour system (similar to those of the proposed Program) to limit these impacts to marine resources. Further investigation would be required to ascertain the level of impact significance associated with impingement and entrainment. An 8-mgd facility would require more energy usage (electricity) than the proposed Program. Other impacts that could incrementally increase include noise generation from pump operations; alteration of the visual quality of the surrounding environment (larger facility size); increase in the transport, use, and storage of hazardous materials; and discharge of concentrate and other hazardous materials. Mitigation measures identified in this EIR would reduce potentially significant operational impacts.

Participation by a potential partner (i.e., SqCWD) in a cooperative project would unlikely result in additional environmental effects associated with operation of the desalination plant. The additional water available through the desalination plant would not translate to 100 percent delivery to SqCWD. More realistically, the amount of water provided to SqCWD would not likely exceed the amount that would have been provided under the proposed Program. A Joint Operations Agreement between the City and SqCWD would be implemented prior to operation of the plant to establish the amount of water the City would provide to SqCWD. Provision of water to SqCWD would not exceed the sum of the forecasted demand (consistent with affected jurisdictions' projections) and that needed for conjunctive use.

Relationship to Program Objectives

The No Curtailment Alternative is sized to completely eliminate near- and long-term drought shortages and provide a reliable long-term water supply. It would also ensure that customers do not experience any environmental impacts (degradation in visual quality associated with lack of water for landscaping), or economic or social hardships associated with curtailment, thereby exceeding the objective of minimizing such hardships. However, potentially significant construction-related environmental impacts would increase compared to the proposed Program, and operational impacts would also be intensified.

8.2.4 High Curtailment Alternative

Alternative Description

The High Curtailment Alternative is equivalent to Alternative D-1, Profile 3 in the IWP where curtailment is set at 25 percent, with a 2-mgd desalination plant that is expandable to 4 mgd. This alternative is similar to the proposed Program, Alternative D-1, except that the initial capacity of the desalination facility would be decreased to 2mgd and curtailment would increase to 25 percent. This alternative would involve the initial construction of a 2-mgd seawater desalination facility (with space to expand to 4 mgd) consisting of an open-water intake, conveyance and distribution system, treatment plant, and concentrate disposal system that connects to the City's existing wastewater system. The footprint accommodating the desalination facility would be comparable to the three-acre site under the proposed Program, and pipeline diameters would be slightly smaller.

Water supply needs would be reduced due to the higher level of rationing on local water users during drought years (through voluntary and mandatory cutbacks). Under this alternative, expansion of the 2-mgd plant would be based on the actual timing and amount of growth, consistent with adopted projections of local and regional jurisdictions, but could ultimately reach 4 mgd if the City's water demand continues as projected. Incremental expansion of the facility would require additional environmental review.

Under the worst case hydrologic conditions (i.e., those that occurred in 1977), the expected peak-season shortage would be about 25 percent. Table 8-5 below shows the likely curtailment level that would be needed for each major customer group to achieve a system-wide 25-percent cutback. Health and safety uses would be reduced by 10 percent. Business uses would be reduced by 15 percent. Outdoor irrigation would be reduced by 65%.

Table 8-5
Peak Season Cutbacks in a 25% Water Shortage

CUSTOMER CLASS	PEAK SEASON CUTBACK APRIL-OCTOBER
Single Family Residential	30%
Multi-Family Residential	25%
Business	15%
Industry	15%
University of California	25%
Municipal	65%
Irrigation	65%

The operational frequency of the desalination facility under the High Curtailment Alternative would be similar to that of the proposed Program, described in Tables 4-5 and 4-6 of the Chapter 4, Program Description. For the near-term, the plant would be operated to meet the City's drought demands. In the long-term, it would be used to meet drought demands as well as increases in demand, thus coninuiing to provide the water service area with reliable water supply.

The High Curtailment alternative could also be applied to the D-2 operational scenario as described in Tables 4-5 and 4-6 in the Program Description. Alternative D-2 would allow for the provision of water to SqCWD. During drought occurrences, the City would operate the plant for its needs and additional water, if any, would be provided to SqCWD. During nondrought years, water would be provided to SqCWD to meet its demands and recharge the groundwater aquifer. The precise quantity of water provided to SqCWD would be specified in a Joint Operations Agreement between the two agencies, but would not likely to be more than would be provided under the proposed Program. Provision of water to SqCWD would not exceed the sum of the forecasted demand (consistent with each jurisdictions' projections) and that needed for conjunctive use (refer to Chapter 6, Growth Inducement and Secondary Effects of Growth).

Environmental Evaluation

Under the High Curtailment Alternative, the water system would be operated following the same priorities as under the No Program and Proposed Alternatives: demands would be met first with surface water, followed by groundwater. Up to 2 mgd of groundwater would be pumped during peak seasons of drought years, which would be the case with or without the proposed Program. The effects of groundwater production during a drought would be similar to those described for the proposed Program (see Section 5.1, Hydrology and Water Quality).

This alternative would vary minimally from the proposed Program. A 2-mgd plant would require generally the same footprint (three acres) to accommodate the plant; sizing of the pipelines would vary minimally. Therefore, construction-related impacts would be slightly less than those described in Chapter 5 for the proposed Program. Operational impacts would also be similar to those of the proposed program; however, marine-related impacts from impingement and entrainment would be reduced, as the total volume of water taken in through the intakes would be less than under the proposed Program. All potential effects associated with this alternative would be reduced to less-than-significant levels with implementation of measures identified in this Draft EIR.

The primary difference between this alternative and the proposed Program is the curtailment level. A 25 percent overall system curtailment level is regarded as a serious shortage under the City's drought contingency plan. Under a serious shortage, residential rationing would likely be in effect, and outdoor watering reductions would become significant and widespread. Turf and intensively gardened areas would show serious damage, and trees and shrubs would show some damage. The percentage loss in value of landscaping would be more than that discussed for the proposed Program (see Section 5.10, Visual Quality), but would not reach such extremes as could occur under the No Program Alternative.

Please refer to the *Water Curtailment Study* for a discussion of the expected hardships borne by the residential, commercial, industrial, and large landscape customers; effects to commercial and industrial customers are not discussed herein because such effects would primarily be social and economic.

The participation by a potential partner (i.e., SqCWD) in a cooperative project would result in similar environmental effects as that identified for the proposed Program. No additional effects would occur.

Relationship to Program Objectives

The High Curtailment Alternative was based on the IWP recommendation that the City's water plan limit any future water shortages to no more than percent 25 percent. This alternative would provide the least amount of additional water necessary to achieve all of the objectives of the proposed Program (see Table 8.2-3), as well as slightly reduce the duration and intensity of environmental effects. The higher curtailment, however, would increase the potential loss in value of landscaping (and consequently the potential for degradation in visual quality), and impose greater economic or social hardships on customers.

8.2.5 Environmentally Superior Alternative

CEQA requires the identification of an environmentally superior alternative. If the no project [No Program] alternative is determined to be the environmentally superior alternative, CEQA requires that the EIR identify an environmentally superior alternative among the other alternatives (*CEQA Guidelines* Section 15126.6[e]). The identification of the environmentally superior alternative is based on a comparison of impacts that would result from each alternative, as described above.

A comparison of the alternatives is provided in Table 8-6. Except for the No Program Alternative, all alternatives would meet the basic objectives of the proposed Program. The No Program Alternative would not require the construction or operation of any facilities, and therefore no direct physical changes to the environment would occur. There are tradeoffs among the alternatives associated with the level of environmental impacts and with socioeconomic impacts that are not specifically addressed in this Draft EIR. The No Curtailment Alternative would eliminate the need to ration water during drought conditions, but would require a larger facility that would result in more construction- and operation-related impacts (i.e., to marine resources and energy consumption). The High Curtailment Alternative would increase the curtailment level during peak-season drought conditions, but would require a comparatively smaller facility that would generate less operation-related impacts compared to the proposed Program. Higher curtailment translates to potentially greater effects to the visual quality of landscaping as well as potential hardships on customers.

Based on the above analysis, the No Program Alternative would be the environmentally superior alternative because it would reduce nearly all of the significant impacts identified under the proposed Program. However, consideration of additional water supply would be imperative in the near future in order for the city to meet its existing and future needs. Consistent with CEQA requirements, another alternative must be identified as an environmentally superior alternative. Therefore, the High Curtailment Alternative would be the environmentally superior alternative.

Yet, even though the High Curtailment Alternative is technically environmentally superior, both the Proposed Program and the High Curtailment Alternative result in few environmental impacts that cannot be mitigated. As such, there is little environmental distinction between the Proposed Program and the High Curtailment Alternative.

Table 8-6
Comparison of Alternatives to Proposed Program

COMPARISON CRITERION	PROPOSED PROGRAM D-1	PROPOSED PROGRAM D-2	NO PROGRAM ALTERNATIVE	NO CURTAILMENT ALTERNATIVE (D-1 & D-2)	HIGH CURTAILMENT ALTERNATIVE (D-1 & D-2)
Generally Meets Program Objectives	Yes	Yes	No	Yes	Yes
Construction-related Environmental Impacts	Initial 2.5-mgd plant	Slightly greater than D-1 (additional pipeline)	No impact	Slightly greater than D-1 (larger footprint)	Slightly less than D-1
Operations-related Environmental Impacts	Effects to marine resources; energy usage	Marine effects greater than D-1; Energy usage –greater than D-1	No impact	Greater than D-1	Slightly less than D-1
Visual impacts associated with landscaping / hardships from curtailment	Up to 15 percent curtailment	Up to 15 percent curtailment	Greater than D-1 (up to 45 percent)	No impact	Greater than D-1 (up to 25 percent)
Growth inducement potential	Meets current shortage, serves planned growth	Meets current shortage, serves planned growth	May not be able to meet planned growth	Same as D-1	Same as D-1
Groundwater recharge	No recharge provided	Greater potential for groundwater recharge	No recharge provided	Greater potential for groundwater recharge (than for proposed program)	Lower potential for groundwater recharge (than for proposed program)

Source: Gary Fiske & Associates, 2003; EDAW, 2005.

8.2.6 Environmentally Superior Operational Scenario

In most cases, the CEQA significance level of impact between the two operational alternatives is similar. Greater detail and discussion on the distinctions between the operational scenarios of the alternatives is provided here for use by decision makers.

Alternatives D-1 and D-2 would require the same facilities, with the exception of an additional pipeline that would be required only for Alternative D-2. Alternative D-2 would operate more frequently than Alternative D-1. The primary differences between the two alternatives are the additional construction effects of Alternative D-2 and the operational effects from increased use of the plant, under any of the capacity scenarios.

Table 8-7 summarizes the relative environmental ranking of the two operational scenarios, followed by a discussion of each issue area. Distinctions between the operational alternatives are seen in the environmental issue areas of hydrology and water quality, marine resources, air quality, hazards, energy, and construction traffic, with Alternative D-1 being environmentally superior.

Table 8-7
Environmentally Superior Alternative by Environmental Issue Area

ENVIRONMENTAL ISSUE AREA	ALTERNATIVE D-1	ALTERNATIVE D-2
Less impact on groundwater		√
Less impact on water quality discharge of chemical waste	√	
Less impact on water quality from discharge of combined concentrate and effluent		√
Less impact to marine resources (impact from impingement and entrainment)	√	
Less impact on air quality	√	
Less impact due to the use, storage, and transport of hazardous materials	√	
Less energy consumption	√	
Fewer traffic-related impacts due to construction	√	
Fewer impacts as related to growth-inducement and secondary impacts of growth	--	--
Overall Environmentally Superior	√	

Note: A √designates that this Alternative is qualitatively superior for that particular environmental issue area. However, the CEQA level of significance is equal for each issue area above, except groundwater. For groundwater, there is a beneficial impact under Alternative D-2 due to the opportunity to increase groundwater recharge during droughts and to reduce groundwater pumping in SqWCD.

Groundwater Effects

Potential impacts to the Purisima aquifer as associated with the use of the Live Oak well field and the differences in those effects between Alternatives D-1 and D-2 are discussed here.

Groundwater Overdraft

For the first and subsequent increments of Alternatives D-1 and D-2, the City anticipates that it will pump, on average, about 187 mgy, which is consistent with the 17-year baseline rate, and 20 mgy (or 12%) more than the groundwater production rate of the last four years. This difference is low when considering the large variability in hydrologic conditions which affect pumping rates and total pumping in the aquifer. Thus, the D-1 alternative would not contribute to additional aquifer storage depletion and is considered to have a less-than-significant impact on groundwater storage within the basin.

For the first and subsequent increments of Alternative D-2, delivery of desalination water to SqCWD during normal and wet years would also allow reduced pumping in that district and would more than compensate for the small anticipated increase in pumping by the City. Considering the benefit of reducing groundwater pumping in SqCWD, this alternative would contribute to additional groundwater in storage and is considered to have a beneficial impact on the groundwater basin.

Stream Flow and Surface Water Depletion

The magnitude of effect that groundwater withdrawal has on a surface water body is variable and influenced by factors that include the local geology and hydrogeology, the proximity of the withdrawal to the surface water body, and the amount of groundwater extracted.

The City's Live Oak well field is a considerable distance (1,500 feet or greater) from most sensitive surface water features (including Soquel Creek). The primary component of groundwater produced from the City wells is offshore flow that would otherwise emerge as a subsurface discharge to the ocean.

Given the state of understanding of the historical natural conditions, production under all Program alternatives would have a less-than-significant impact on surface waters, including coastal lagoons and estuaries.

Seawater Intrusion

Basin water level conditions that have developed since the last drought period (1987-1988) indicate that the City's ability to produce at the historical rate of 2 mgd during a drought might be precluded by conditions that have developed from the increased annual demand by other pumpers in the basin since that time. In the future, if pumping by all users continues at present rates, then the City's use of the Live Oak wells at 2 mgd (during drought conditions) could exacerbate this condition and result in potentially significant impacts.

Under both increments of Alternative D-2, the provision of water to SqCwd provides a means for the District to reduce pumping and potentially reverse the groundwater overdraft trend. This could restore coastal water levels in the Live Oak area and allow historical well production by the City without seawater intrusion, thus providing a beneficial impact. Given the increased opportunity for aquifer recharge and the lower potential for seawater intrusion, Alternative D-2 would be preferable for this environmental issue area.

Water quality effects from discharge of chemical waste

Alternative D-2 would be operated more frequently during both drought and non-drought periods. This Increased usage would translate to an overall increase in the volume of chemicals used for water treatment and in volume of concentrate discharge. Alternative D-1 would use less water treatment chemicals, but would require some use of acidic/basic cleaning solutions to preserve the Reverse Osmosis (RO) membranes when the plant is not in use. Disposal of cleaning solutions would result in water quality degradation if not disposed of properly, and would be larger in volume for Alternative D-2 compared to D-1. Therefore, Alternative D-2 would potentially result in more adverse effects due to discharge of chemical waste if mitigation measures are not implemented. The same mitigation measure is applicable for both alternatives to reduce potential effects to ocean water quality.

Water quality effects from discharge of combined concentrate and effluent

Concentrate would be mixed with wastewater effluent prior to discharge into the Pacific Ocean. As the effluent plume would be higher in salinity, lower in temperature, higher in density, and have lower initial concentrations of wastewater pollutants than the stand-alone wastewater plume, this a potential benefit of mixing. Regular disposal of the combined discharge could result in potentially more beneficial impacts under Alternative D-2 as operation of the plant would be constant.

Marine resources

Implementation of Alternatives D-1 and D-2 in the near term would cause less-than-significant impacts based on the maximum daily seawater intake. However, expansion of the facility to 4.5 mgd under Alternative D-2 may be approaching a volume that could have a significant impact on some species. It is not possible to predict the impact at this point and relevant studies to quantify impacts to species would be required to reduce potential effects to less than significant levels. The potential for significant entrainment and impingement impacts to marine organisms is considered to be higher for Alternative D-2 and, as such, Alternative D-1 would be considered environmentally superior for marine resources.

Air Quality

Increased operation of the D-2 alternative for both the first and subsequent increments of desalination plant operation would result in greater annual emissions of volatile organic compounds (VOC) and NO_X (NO_X includes various combinations of nitrogen and oxygen, including NO, NO_2, NO_3). While the thresholds of significance for these compounds, as established by the Monterey Bay Unified Air Pollution Control District (MBUAPCD), are not exceeded for any increment of either of the operational alternatives, the annual emissions for D-2 are between 2 and 3 times the emissions for D-1. As such, Alternative D-1 would be considered environmentally superior due to potential impacts to air quality.

Hazardous Materials

Increased operation of the plant associated with Alternative D-2 would necessitate the storage, transport, and use of larger volumes of chemicals than under Alternative D-1. Although impacts associated with either alternative would be reduced to less-than-significant levels with the implementation of a Hazardous Materials Management Plan, there is a significant difference between the alternatives associated with the increased operation. Therefore, Alternative D-1 would be considered environmentally superior for this issue area.

Energy Consumption

The first and subsequent increments of D-2 would consume between three and five times more electricity than the first and subsequent increments of D-1. As such, D-1 would be considered environmentally superior with regard to energy consumption.

Construction traffic-related effects

The need for an additional pipeline to convey water from the City to SqCWD under Alternative D-2, would cause temporary, construction-related land use disturbances. These include, but are not limited to, increases in noise and dust, traffic delays, and access restrictions. Therefore, relative to Alternative D-1, Alternative D-2 would result in more potentially adverse effects if mitigation measures are not implemented, and Alternative D-1 would be environmentally preferable. Mitigation measures identified in this EIR would reduce such effects to less-than-significant levels.

On a cumulative project level, improvements on Highways 1 and 17 may also occur simultaneously with Alternative D-2 of the proposed Program (for Corridors 5 and 6). If this occurs (the Highway 1/17 Widening for Merge Lanes will begin in fall 2005 if sufficient funding is available), and although Caltrans would maintain two lanes of traffic on the highway, construction activities could slow traffic, and cause motorists to select surface street routes to bypass the affected highway segments.

The traffic volume on Highway 1 between Soquel Drive and Morrissey Boulevard was 114,000 per day in 2002 (SCCRT, 2004). Any vehicles diverted from the highway would add to the traffic volumes on Soquel Drive and Soquel Avenue, both of which are designated as Countywide Congestion Management Roadways. Existing traffic volumes on these roadways can approach 24,000 vehicles per day (see Table 5.12-1 in Section 5.12, Traffic and Transportation). The increase in both construction and other traffic on these roadways could result in significant cumulative impacts (e.g., traffic delays and congestion) if both projects occur simultaneously, particularly during the peak traffic hours. As part of the traffic control plan for the proposed Program, Mitigation Measure 3.12-1c specifies the need to identify areas where construction would be limited to non-peak hours to reduce traffic flow restrictions. However, limitations on construction activities (for Alternatives D-2 Corridors 5 and 6) to non-peak hours may not be sufficient to reduce congestion and traffic delays if constructed concurrently with the Highway 1/17 Widening for Merge Lanes Project. As such, Alternative D-1 is environmentally preferable with regard to construction traffic-related impacts, on a cumulative level. Implementation of Mitigation Measures C-2 and C-3 would reduce the proposed Program’s contribution to potential, significant cumulative traffic impacts to less than considerable.

Growth-inducement and secondary impacts of growth

The first increment of Alternative D-1 closes the gap between City's anticipated available water supply (during peak seasons of dry years) and demand as based on projected and approved growth. It also supports growth consistent with that planned and approved in the County General Plan and Local Coastal Program and the City's General Plan and Local Coastal Program. The impacts of this approved growth were addressed in the EIRs for these plans.

For the first increment of Alternative D-2, water is again provided for the City's water needs during the peak seasons of dry years, as well as to provide supplemental water to SqCWD to recharge the groundwater basin (i.e., the Purisima) that is shared by the City and the District. The impacts associated with water produced for supplemental supply for the District will be addressed in the District's EIR. Operational constraints (operations agreement and/or policy statements (e.g., ordinances) by each agency would set the parameters of operations between the City and SqWCD. The level of impact for Alternatives D-1 and D-2 would thus be considered less than significant, but equal to each other.

For the subsequent increments of Alternatives D-1 and D-2, water is provided for the City's water needs during peak seasons of dry years, as well as for future growth. The secondary impacts of this alternative on growth (e.g., increased burdens on infrastructure including roadways, transit, schools, and other public services; increased air pollution and noise from increased traffic) would be determined in future environmental review when the adopted land use plans of the City and County, and future population projections are updated. As such, the first increment of Alternatives D-1 and D-2 are environmentally superior to the subsequent increments of Alternatives D-1 and D-2, with relation to growth-inducement and the secondary impacts of growth.

8.2.7 Environmentally Superior Desalination Plant Area

The proposed Program includes three alternative desalination areas, as described in Chapter 4 and as shown in Figures 4-1 and 4-2. The evaluation of the environmentally superior desalination area is primarily focused on potential siting effects, both in terms of construction and operation. It should be noted that because the specific locations of the plant within each area have not been identified, this analysis is based on a generalized potential for impacts. It is possible that such impacts within a site could be completely avoided; however, absent site-specific information, it is assumed that potential effects would occur.

The environmental issues that distinguish the desalination areas include land use, biological resources, noise, and visual resources, with the industrial park area being environmentally superior. Table 8-8 provides a summary of the relative comparison of these environmental impacts, and indicates that the Industrial Park Area is the environmentally superior site. Note that the intent of this table is not to identify all potentially significant impacts, but to identify impacts where there are differences between the alternative areas.

Table 8-8
Relative Comparison of Desalination Plant Area Options

ENVIRONMENTAL ISSUE AREA	INDUSTRIAL PARK AREA	SHAFFER ROAD/ ANTONELLI'S POND AREA	TERRACE POINT AREA
Less potential for damage to structures or risk to people from flooding	√		√
Less potential to affect special-status avian species, reptiles, amphibians, and mammals	√		
Less potential to expose people to or generate noise in excess of established standards	√		
Less potential to conflict with utilities		√	
Less potential to degrade the visual quality of the surrounding environment	√		
Overall Environmentally Superior	**√**		

Note: A √designates that this site is qualitatively superior for that particular issue area. The CEQA level of significance for each issue area above is also similar to these rankings except for impacts to visual quality, which are equal when tested against the CEQA significance levels.

Hydrology

A section of the Shaffer Road/Antonelli's Pond Area is located within the Moore Creek 100-year floodplain. There are no 100-year floodplains in the Industrial Park Area or the Terrace Point Area. Absent siting the facility outside the floodplain, potential flooding effects would be considered potentially significant at the Shaffer Road/Antonelli's Pond Area, and therefore the Industrial Park Area is the environmentally superior site with regard to impacts due to flooding.

Biological Resources

The differences between the three sites are based on the presence of or proximity to special-status species. The Shaffer Road/Antonelli's Pond Area and the Terrace Point Area both support special-status avian species, including raptors. In addition, these areas are located in the vicinity of Antonelli's Pond, a known location for California red-legged frog and southwestern pond turtle. The pond may also provide habitat for the dusky-footed woodrat. Indirect effects to these species may occur if they move through work areas. Prior to implementation of mitigation measures (e.g., preconstruction surveys), the potential for significant effects are higher at the Shaffer Road/Antonelli's Pond and Terrace Point Areas compared to the Industrial Park Area. Therefore, the Industrial Park Area would be the environmentally superior site with regard to impacts on biological resources.

Noise

Noise would be generated from operation of the desalination facility (electric transformer, filtration activities, and pumps). Due to the surrounding uses, on-site noise at the Industrial Park Area is not anticipated to exceed applicable standards. The Shaffer Road/Antonelli's Pond Area and the Terrace Point Area are located near residential uses (De Anza Mobile Home Park). Absent mitigation measures (e.g., siting or incorporation of enclosures), potential noise effects are more likely at the Shaffer Road/Antonelli's Pond and Terrace Point Areas compared to the Industrial Park Area, and therefore, the Industrial Park Area is the environmentally superior site with regard to potential impacts due to noise.

Public Services and Utilities

Potential utility conflicts, including interruption of service and damage to utilities, may occur during construction activities. The potential for this impact is determined by the extent of development, nature of the land, and the final location of the proposed facility. Portions of both the Industrial Park Area and the Terrace Point Area are developed. The potential for utility conflict, prior to implementation of mitigation measures, would therefore be greater at these sites compared to the undeveloped Shaffer Road/Antonelli's Pond Area. Therefore, the Shaffer Road/Antonelli's Pong Area is the environmentally superior site with regard to the potential impacts to utilities.

Visual Resources

The proposed desalination plant under both Alternatives D-1 and D-2 would require construction on a 3-acre site. Construction of a desalination facility at the Industrial Park Area would not alter the visual character of the surroundings as such a facility would integrate with the designated industrial uses of the area. Development of such a facility would alter the visual character of the area at the two other sites, as the Shaffer Road/Antonelli's Pond Area and the Terrace Point area are surrounded by non-developed and open space areas. Absent these mitigation measures (e.g., vegetative or architectural treatment), potential adverse visual effects are more likely at the Shaffer Road/Antonelli's Pond and Terrace Point Areas compared to the Industrial Park Area. Therefore, the Industrial Park Area is the environmentally superior site with regard to the potential for impacts to visual resources.

8.2.8 Environmentally Superior Pipeline Alignments

The proposed desalination facility would require three to four pipelines, depending on the operational alternative (a detailed description of the pipeline corridors are described in Chapter 4, Program Description; see Figures 4-1 and 4-2)). They include the raw water intake pipeline (Corridor 1), the treated water distribution pipeline (Corridors 2 and 3), the concentrate discharge pipeline (Corridors 1 and 4), and the Alternative D-2 pipeline (Corridors 5, 6, and 7). The evaluation of these alternative pipelines evaluates the constraints of entire pipeline corridors rather than specific streets within each corridor. All but the raw water intake pipeline include more than one routing option.

The evaluation of the environmentally superior pipeline alignments is primarily focused on siting and constructability, in view of the fact that once the pipelines have been buried underground, potential impacts are unlikely. Similar to the alternative analysis for the desalination area, this analysis is intended to identify the distinguishing factors. The environmental issues that distinguish the pipeline alignment alternatives include recreation, water quality, biological resources, and traffic. Tables 8-9, 8-10 and 8-11 provide a summary of the relative comparison of these environmental issue areas, and show that Corridor 3 is the environmentally superior route for the treated water distribution line, that there is no distinction between Corridors 1 and 4 for the concentrate discharge pipeline, and that Corridor 7 is environmentally superior for the Alternative D-2 pipeline.

Treated Water Distribution Pipeline (Corridors 2 and 3)

Figures 4-1 and 4-2 in Chapter 4 (Program Description) show the location of the two corridors. As both corridors share portions of the corridor south of Mission Street/Highway 1, this analysis focuses on the differences from that point northward to the Bay Street Reservoir. As shown in Table 8-9, the environmentally superior corridor for the Treated Water Distribution Pipeline would be Corridor 3, as it would result in the least amount of impact. The following discussion provides a comparative analysis of the two pipeline corridors in support of this determination.

Table 8-9
Relative Comparison of Treated Water Distribution Pipeline Options

ENVIRONMENTAL ISSUE AREA	CORRIDOR 2	CORRIDOR 3
Less impact to recreational facilities		√
Less impact to wetlands or waters of U.S. (water quality degradation)		√
Less potential impact to special-status species		√
Less impact to traffic-flow during construction	√	
Overall Environmentally Superior		√

Note: A √designates that this pipeline corridor is qualitatively superior for that particular issue area. The CEQA level of significance for each issue area above is also similar to these rankings.

Recreation

University Terrace Park is located along Corridor 2, at Meder Road. As there is a potential that the pipeline installation along Meder Road would restrict access to the park, the potential for impacts to recreational resources would be greater along Corridor 2 compared to Corridor 3 (no parks are located adjacent to this corridor north of Highway 1) prior to implementation of mitigation measures.

Water Quality and Biological Resources

Corridor 2 crosses Arroyo Seco Canyon Drainage at three locations, whereas Corridor 3 would cross this drainage at one location. Depending on the construction method for crossing sensitive resources, potential impacts to wetlands, waters of the U.S., and riparian areas may occur. As such, Corridor 2 has a higher potential to degrade water quality and create adverse effects to biological resources may be higher.

Traffic and Transportation

Both Corridors 2 and 3 cross Highway 1, and traverse through residential streets. Pipeline installation may result in the closure of a lane, therefore reducing traffic width and resulting in potential delays for vehicles traveling past the construction zone. Bay Street (Corridor 3) is an arterial street that provides primary access to University of California–Santa Cruz (UCSC). Due to the heavy traffic that occurs on Bay Street during the peak hours, potential closure of a traffic lane may result in significant traffic circulation impacts. Western Avenue is a divided 2-lane roadway through residential uses that also provides access into the University. Traffic volumes are not available for this street, but it is unlikely that the existing volume of traffic would be as high as Bay Street, particularly during peak traffic hours. Corridor 2 would therefore have lower potential impacts than Corridor 3.

Concentrate Discharge Pipeline (Corridors 1 and 4)

Figures 4-1 and 4-2 in Chapter 4, Program Description, show the location of the two corridors. Both corridors share common routes along Delaware Avenue from the proposed desalination area to approximately Almar Avenue. Any differences in the potential for impacts of these two corridors would therefore be associated with the areas that are not shared; east of Almar Avenue and south of Delaware Avenue. As shown in Table 8-10, both concentrate discharge pipeline alternatives scored equally; therefore neither alternative can be declared environmentally superior according to this analysis. An additional factor not captured in the environmental analysis that could influence the selection of the environmentally superior corridor is the fact that potential impacts would likely be less if the pipeline could be built within an existing corridor. Constructing the concentrate discharge pipeline in the same excavated trench as the raw water intake pipeline would increase environmental impacts of that construction only incrementally compared to pipeline installation along two separate trenches. The viability of that option would be dependent on the engineering parameters of the concentrate discharge pipeline.

The following discussion provides a comparative analysis of the two pipeline corridors to support the conclusion that an environmentally superior corridor cannot be distinguished.

Table 8-10
Relative Comparison of Concentrate Discharge Pipeline Options

ENVIRONMENTAL ISSUE AREA	CORRIDOR 1	CORRIDOR 4
Less impact to schools and recreational facilities		√
Less impact to wetlands or waters of U.S. (water quality degradation)	√	
Overall Environmentally Superior	√	√

Note: A √designates that this pipeline corridor is qualitatively superior for that particular issue area. The CEQA level of significance for each issue area above is also similar.

Land Use and Recreation

The concentrate discharge pipeline may connect to the wastewater treatment pipes either at or near the existing junction structure or at the wastewater treatment plant. Depending on the alignment location within Corridor 1, construction activities may result in temporary impacts to schools (e.g., lack of access, increase in safety hazards). If connection occurs at or adjacent to the junction structure for this corridor, there is also a potential for extending construction activities at the connection point such that the duration of recreational facility closure (stairway access to the beach and that segment of the Pacific Coast Bicycle Route) would be lengthened. Corridor 4 runs along Bethany Curve Park, and trenching activities may affect access into the park and the beach. Because construction activities for Corridor 1 may affect both schools and recreational facilities, potential impacts would be considered to be higher than for Corridor 4.

Water Quality and Biological Resources

Corridor 4 crosses an additional drainage (Bethany Creek) compared to Corridor 1. As construction techniques have not been selected, and preconstruction surveys have not been conducted for identification of special-status species, the magnitude of impact or type of species that may be affected is not yet known. As Corridor 4 would cross more drainages, effects on water quality and biological impacts may be incrementally higher.

Alternative D-2 Pipeline

Figures 4-5 and 4-6 in Chapter 4, Program Description, show the location of the three options for the Alternative D-2 pipeline. Corridors 5 and 6 share common routes from Water Street (at Ocean Street) to the junction of Soquel Avenue and Capitola Road, then follow those roads, respectively, to end points north and south of Highway 1. These corridors traverse primarily through residential and commercial uses. Corridor 7 traverses Ocean Street from Water Street, and generally follows the railroad right-of-way to 41st Street. This analysis highlights the difference in the amount of impact associated with each corridor. As shown in Table 8-11, the environmentally superior corridor for the Alternative D-2 Pipeline would be Corridor 7, as it would result in the least amount of impact. The following discussion provides a comparative analysis of the three pipeline corridors to support the identification of the environmentally superior corridor.

Table 8-11
Relative Comparison of Alternative D-2 Pipeline Options

ENVIRONMENTAL ISSUE AREA	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
Least impact to wetlands or waters of U.S. (water quality degradation)			√
Least potential for impacts to special status species			√
Least impact to cultural resources			√
Lower traffic-related impacts			√
Overall Environmentally Superior			√

Note: A √designates that this pipeline corridor is qualitatively superior for that particular issue area. The CEQA level of significance for each issue area above is also similar to these rankings.

<u>Water Quality and Biological Resources</u>

Corridors 5 and 6 cross Branciforte Creek, Arana Gulch, and Rodeo Gulch. Corridor 7 crosses only the latter two drainages. Depending on the construction method employed for crossing sensitive resources, impacts to wetlands, waters of the U.S., and riparian areas may occur. As construction techniques have not been selected, and preconstruction surveys have not been conducted, the magnitude of impact and type of habitat and species that would be affected is not known. As Corridors 5 and 6 would cross more drainages, effects on water quality and biological impacts would be considered higher for those corridors than for Corridor 7.

<u>Cultural Resources</u>

Known cultural resources are located in the vicinity of the three corridors, and may be impacted by construction activities along the corridors. Corridors 5, 6, and 7 potentially affect three, six, and one recorded cultural resources, respectively. The relative impacts of Corridors 5 and 6 are therefore higher than those of Corridor 7.

<u>Traffic</u>

Potential traffic-related impacts that distinguish the alignments include road closures, traffic flow and access restrictions, safety hazards, and effects on rail operation. Corridors 5 and 6 consist of mixed commercial and residential uses. These roads are heavily traveled, averaging more than 15,000 vehicles per day. As a result, closure of one lane may have an adverse impact on traffic flow. The Branciforte Elementary School is located along Corridor 5. This school and the Live Oak Elementary School are located along Corridor 6. Corridor 7 is primarily aligned with a railroad right-of-way, and construction activities along this alignment would result in less traffic circulation and general safety effects.

8.2.9 Alternatives Eliminated From Further Consideration

Prior to the IWP process, the City conducted numerous studies over a period of approximately 20 years to explore water supply alternatives. This has been in response to a recognized future need of the City to meet anticipated water supply shortages during drought years. The IWP process is described in Chapter 4, Program Description. It also describes other strategies that were considered but eliminated (*CEQA Guidelines* Section 15126.6 (a) indicates that an "EIR is not required to consider alternatives which are infeasible"). Figures III-1, III-2, and III-3 of the IWP summarize the water supply alternatives that were considered in the last two decades and the reasons alternatives were not carried forward.

Additional alternatives of the Program were suggested during the Notice of Preparation (NOP) scoping period. These recommendations and the reasons for dismissal are shown in Table 8-12.

Table 8-12
Alternatives Proposed during the IWP NOP Scoping Period

ALTERNATIVES SUGGESTED DURING THE PUBLIC COMMENT PERIOD	REASONS FOR DISMISSAL
Alternative sources of energy (solar, wind, or other renewable energy sources to supply the desalination plant)	The *Alternative Water Supply Study* evaluated the alternatives to conventional power supplies, including photovoltaic and fuel cells. It concluded that these sources are not feasible at this time for power requirements typical of large-scale, industrial-type applications (Carollo, 2002).
Consider cistern water storage for commercial and industrial accounts; store water at point of use	Infeasible as it would not provide sufficient yield
Implement aboveground "flume-like" pipes instead of buried pipelines	Does not apply
Consider use of beach wells	Beach wells for intake and discharge were evaluated in the *Evaluation of Regional Water Supply Alternatives* (Carollo, 2002). This alternative is constrained due to the geometry and hydrogeology of the beaches.
Consider tertiary water treatment	Reclamation was considered as part of the IWP, but was deemed infeasible.

Sources:: EDAW, 2004; Carollo,2002

References

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Chapter 9 Report Preparation

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A NOTICE OF PREPARATION, SUMMARY OF NOP SCOPING MEETING COMMENTS AND WRITTEN LETTERS RECEIVED

CITY OF
SANTA CRUZ

WATER DEPARTMENT

October 28, 2003

NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT

RE: CITY OF SANTA CRUZ WATER DEPARTMENT INTEGRATED WATER PLAN
(Project Title)

To Interested Agencies and Persons:

The City of Santa Cruz, as the lead agency, is preparing a Program Environmental Impact Report (EIR) on the project described herein. Please respond with written comments regarding the scope and the content of the EIR as it may relate to your agency's area of statutory responsibility or your areas of concern or expertise. Your agency will need to use the EIR prepared by our agency when considering your permit or other approval for the project, if any is required. *Responses are due within 30 days of the receipt of this Notice, as provided by State law.* The contact person's name and address are listed below. Please include the name and phone number of a contact person at your agency in your response.

1. Project Description. Santa Cruz Water Department Integrated Water Plan. Please see attached Project Description for full description of the proposed Project.

2. Project Location. The proposed project would be located within the greater Santa Cruz area (see Figure 1, attached).

3. Probable Environmental Effects of the Project.

The City would evaluate the potential impacts associated with implementation of the Integrated Water Plan at a program-level of detail. Pursuant to CEQA Guidelines Section 15168(a), a Program EIR is prepared on a series of actions that can be characterized as one large project, and related either geographically or as logical parts in the chain of contemplated actions. As site-specific information typically are not available at a program-level EIR stage, the environmental evaluation is not intended to provide detailed analyses as would be the case for a project-level EIR. However, should the City Council certify the Program EIR, then additional site-specific design and engineering would be conducted such that subsequent project-level, environmental documentation would be prepared for specific components (e.g., construction and operation of a 2.5 million gallons per day (mgd) desalination plant, and expansion of the plant, as needed). This Program EIR will evaluate the potential for adverse, environmental effects associated with the construction and operation of the proposed facilities to as much detail as possible given the site-specific information available. An initial study, which is typically prepared to determine if a proposed project would result in significant effects on the environment, was not prepared for this program. CEQA Guidelines 15063(a) specifies that an initial study is not required if a Lead Agency determines that an EIR will clearly be required. However, a preliminary screening of these impacts was presented in the Integrated Water Plan (IWP). The screening identified potential, short-term construction and long-term operation impacts associated with the desalination plant for both Alternatives D-1 and D-2. The summary presented below identifies potential effects that could result with program implementation, and thus would be evaluated in the upcoming Program EIR.

Marine Resources: The proposed program could have the potential to affect marine resources associated with impingement and entrainment of marine organisms during underwater construction and operation of the raw water intake. Potential effects on marine resources could occur associated with discharge of the combined brine and wastewater effluent.

Direct Land Use: Construction of the proposed facilities could result in disturbance to adjacent land uses during construction activities. Implementation of the program may conflict with established goals, policies, and regulations, including but not limited to those of the City of Santa Cruz, Local Coastal Program, California Coastal Act, and the UCSC Coastal Long Range Development Plan.

Indirect Land Use (Growth inducement and Secondary Effects of Growth): The proposed program could potentially serve as an inducement to growth by providing a source of water supply locally and regionally.

Transportation / Circulation: Construction of the conveyance facilities could increase safety hazards and congestion on affected roadways, as well as affect access to adjacent uses.

Recreation: Construction of proposed facilities, including the intake / brine disposal facilities, may result in temporary closure of recreational facilities, such as the beach near the intersection of West Cliff Drive and Sunset Avenue.

Visual Resources: Implementation of the proposed facilities could affect the visual character of the site and surrounding uses, including nearby scenic routes. The proposed desalination plant may result in increased light and glare.

Hydrology (Surface and Groundwater): Implementation of the proposed program may have impacts to groundwater resources. Construction of the proposed facilities may result in surface water impacts associated with erosion and sedimentation.

Public Health and Safety / Hazards and Hazardous Materials: The proposed program would result in additional demands on public services and potential safety hazards associated with the use, transport, and storage of hazardous materials at the Desalination Plant. In addition, construction activities may encounter contaminated soils / water that could pose a threat to worker and public safety.

Wetlands, Wildlife, Plants, and Fisheries: Depending on the siting of the proposed Desalination Plant and conveyance facilities, the proposed facilities may affect known wetlands habitat, and/or sensitive, special-status, and common biological species (i.e., California red-legged frog, Ohlone tiger beetle, San Francisco popcorn flower).

Cultural Resources: Recorded cultural resources are located in the vicinity of the proposed facilities. Earthmoving activities associated with construction of the proposed facilities may result in encountering of known / recorded or unrecorded archaeological or historic resources.

Air Quality: The construction of the proposed facilities would result in short-term generation of dust during construction activities. Potential, long-term air quality impacts would be associated with energy consumption.

Noise: The proposed facilities would result in temporary noise and vibration impacts associated with construction. The potential for long-term increases in ambient noise levels would be associated with operations of the various equipment required to convey and treat the water.

Geology and Soils: The proposed facilities could be affected by seismic, geologic, and soil hazards. These hazards include earthquakes, liquefaction, settlement, landsliding, weak expansive soils, and corrosive soils.

Cumulative Effects: The proposed program, when considered in combination with other geographically and temporally proximate construction projects, may result in potential environmental effects.

4. Other Background Information.

Applicant: City of Santa Cruz Water Department (SCWD)
809 Center Street
Santa Cruz, California 95060

Contact: Linette Abbott, Deputy Director
Phone: (831) 420-5200
Fax: (831) 420-5201
Email: labbott@ci.santa-cruz.ca.us

Consultant: EDAW, Inc.
150 Chestnut Street
San Francisco, CA 94111

Contact: Marcia Tobin
Phone: (415) 433-1484
Fax: (415) 788-4875
Email: tobinm@edaw.com

EIR / Project Timeframes:

NOP Scoping Meeting:

Date November 13, 2003
Time 7:00 p.m.
Address 155 Center Street (Police Facility Community Room), Santa Cruz, CA 95060, Santa Cruz, CA 95060

Project Phasing:

Regardless of the alternatives selected, the proposed desalination facility would be implemented in two phases. Phase 1, meeting near-term ("2005")[1] drought supply shortage, would be based on existing, adopted projections in the affected jurisdictions' General Plans. Under this scenario, supplemental water supply would be used to meet water supply shortfalls resulting from drought-related occurrences. Design and construction of the desalination facilities would begin in 2005, with an anticipated completion date of 2008 - 2010.

Phase 2, meeting long-term needs (through 2020) and consisting primarily of increases in the available capacity of the desalination plant, would depend on updated projections in the affected jurisdictions' General Plans[2]. Separating facility phasing would provide the City an opportunity to determine the appropriate expansion timed to actual growth and demand increases. Subsequent project-level analysis would be developed to assess the need for expansion of the desalination plant or other yet to be determined supplemental water supply.

5. Contact Person Name and Phone Number.

See applicant information under No. 4, above.

Sincerely,

Water Director

Attachment: Project Description

1 "2005" was selected as the near-term horizon because it corresponds with the City of Santa Cruz adopted population projections. However, based on actual population values to date, the *IWP* estimated that the 2005 General Plan population projections would not be reached until 2009. Therefore, 2005 is analogous to the IWP's 2009 horizon.

2 The City of Santa Cruz General Plan is currently in the process of update. The City of Capitola is currently updating its Housing Element.

Program Description

Background and Need for the Project:

The City provides water to the City of Santa Cruz, a portion of unincorporated Santa Cruz County and a small portion of the City of Capitola. The service area encompasses an estimated population of 90,000 people and 45,000 jobs. Approximately 95% of the City's water supply comes from surface runoff and storage, with a limited amount from groundwater sources. Four supply sources, including the North Coast Diversions, Live Oak (Beltz Wells), San Lorenzo River diversion, and Loch Lomond Reservoir, support the approximately 30-square mile service area. These sources provide approximately 4,500 million gallons (mg) of water during an average year, which is adequate to meet the City's current customer demand of approximately 4,400 mg. However, there is insufficient water supply to meet existing customer demands during the peak demand season[3] under drought conditions, including the most severe hydrologic conditions. The 1976-77 drought has been established as the most severe drought of record and thus is considered the benchmark used to measure system reliability. At current levels of water provisions, a drought of a magnitude similar to the most-severe drought would require water curtailment levels of 45% during the peak-season (Gary Fiske & Associates, 2003). Even with water conservation, public education, and demand reduction efforts, demand is projected to increase 20% by the year 2030; therefore, the severity of drought-year water shortages is expected to increase if no action is taken to remedy the current situation, and may result in shortages not only during dry rainfall years but also during average rainfall years.

The City prepared an Integrated Water Plan (IWP) (June 2003) that addresses the current / future drought-related crises as well as long-term water supply needs (through 2020). The purpose of the IWP is to help the City to reduce near-term drought year shortages, and provide a reliable supply that meets long-term needs while ensuring protection of public health and safety. The IWP recommends desalination as a viable water supply alternative for further evaluation, along with conservation and curtailment components (described below).

The IWP includes a supplemental water supply option that could provide an opportunity to share resources and costs through participation by the Soquel Creek Water District (SqCWD). SqCWD serves more than 45,000 customers within an approximate seven- by three-mile service area adjacent to the shoreline that includes the City of Capitola and unincorporated communities of Aptos, La Selva Beach, Opal Cliffs, Rio Del Mar, Seascape, and Soquel. This option is currently being evaluated by SqCWD as one of the alternatives being considered in the update to its 1999 Integrated Resources Plan (IRP)[4]. Existing demands and the lack of supplemental supplies within the SqCWD service area have resulted in overdrafting of the Purisima groundwater aquifer by an estimated 600 acre-feet per year (afy) [5] more than the sustainable yield[6]. In order to address this issue, SqCWD has established that its reliance on groundwater should be limited to approximately 4,870 afy, assuming the overall pumping of the basin by other users remains essentially at 1999 levels. Even with water conservation, public education, and demand reduction efforts, demand is projected to increase 20% by the year 2030 based on the current County General Plan. Based on these assumptions, SqCWD has estimated that it needs to supplement existing groundwater resources by approximately 600 afy to meet current demand and by approximately 2,000 afy to meet projected demand within the District's service area at build out (based on the current General Plans). The area is not projected to reach build out until sometime after 2040 (Soquel Creek Water District, 2003); however, in the interim, SqCWD would operate the conjunctive use program in a manner intended to restore groundwater levels to provide a sufficient coastal barrier against seawater intrusion.

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3 The peak demand season is when the rainfall is lowest and demand is highest, typically May through October.

4 SqCWD will determine the appropriate approach to environmental evaluation under CEQA during the update of its IRP.

5 1 acre-foot of water = 325,000 gallons or approximately enough water for three families for an entire year.

6 For the purposes of this document sustainable groundwater yield is the amount of water in the groundwater aquifer that is replenished each year (by precipitation, infiltration, etc.).

Project Location

The proposed facilities would be located within the greater Santa Cruz area (see Figure 1). The project consists of two potential alternatives: a local (city-only) desalination facility that would be located within the southwestern portion of the City's service area (D-1), and a regional desalination facility that would allow potable water to flow into SqCWD's service area (D-2). Facilities required for both alternatives would be located in the southwestern portion of the City of Santa Cruz. Alternative D-2 also requires the installation of infrastructure to convey water from Santa Cruz to the northern end of the SqCWD's service area.

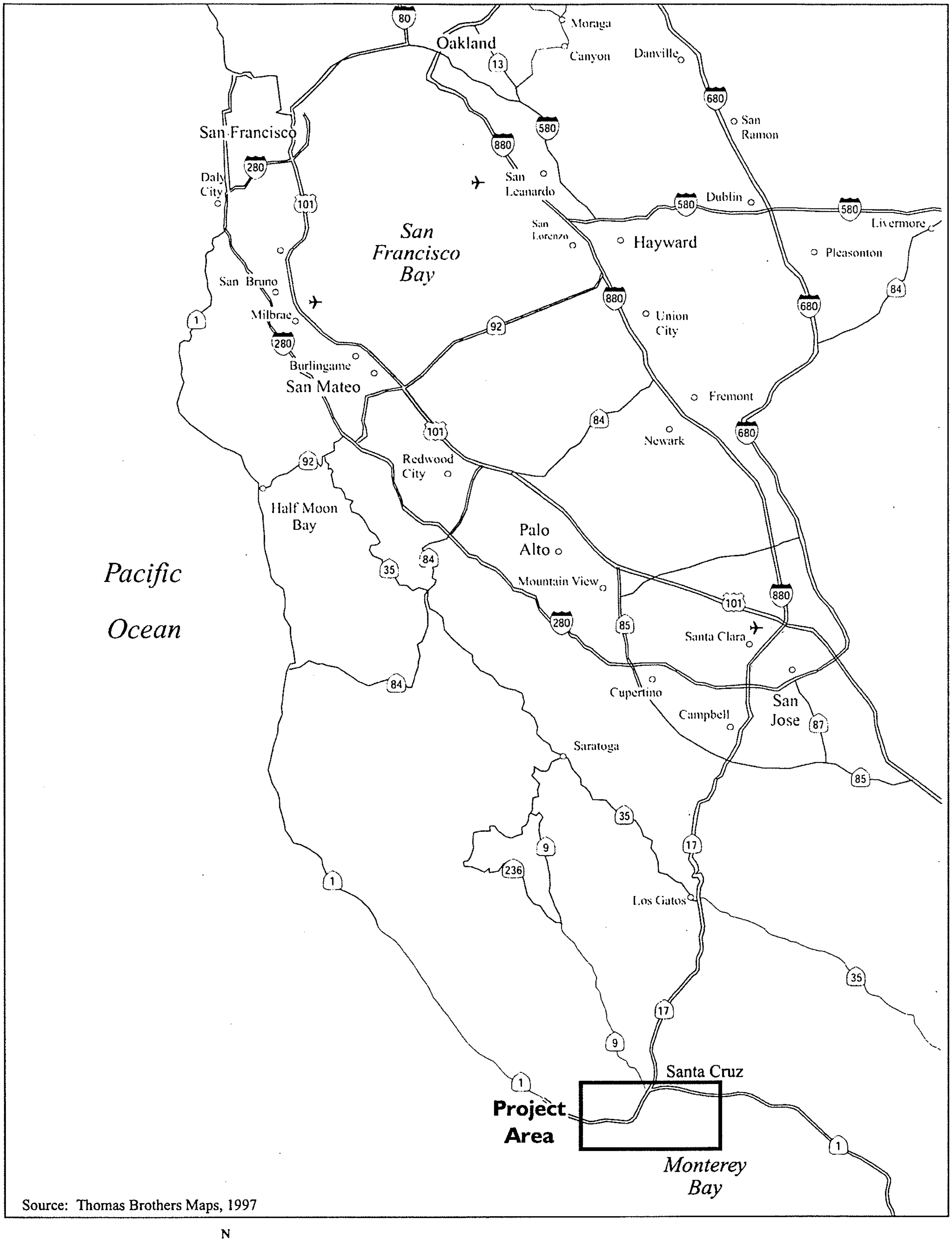

FIGURE I
Regional Location

Project Components

Table 1 shows the components associated with the D-1 and D-2 alternatives. Both would require the City to implement conservation measures for residential and non-residential uses, curtail water up to 15% during an emergency drought scenario, and construct a 2.5 million gallons per day (mgd) desalination plant (with the ability to expand the plant to 4.5 mgd to meet future demands), associated pipelines, pump stations, and infrastructure. Alternative D-2 would include the same project components as those of D-1, as well as require additional conveyance facilities to allow water to be conveyed from the City's service area to SqCWD's service area. Operation of the desalination plant would differ for the two alternatives, as described in Table 1.

Conservation

The programs recommended in the *Santa Cruz Water Department Water Conservation Plan* (February 2000) are included in both Alternatives D-1 and D-2. These long-term programs span the range of end uses for residential and nonresidential customers (see Table 1), and are intended to reduce the need for additional supply through public information and education, pricing and incentives, ordinances and plan reviews, audits, and plumbing fixture retrofits. The Santa Cruz City Council has already directed the City to move forward with implementation of conservation programs. The City would continue to implement these conservation programs, which are expected to achieve an annual demand reduction of nearly 300 million gallons by 2010, or 10-12% overall reduction including naturally occurring conservation due to plumbing code changes.

Curtailment

The City proposes water curtailment of up to 15% during drought emergency events. This amount of curtailment would allow the City to accept and manage some level of peak-season water shortage from time to time rather than to try to eliminate possibility of any future shortage by developing enough supply capacity to overcome the drought of record. This curtailment level was established based on the results of the *Water Curtailment Study,* which analyzes customer response to various peak-season shortage conditions. This level is based on a balance of economic, environmental, and social factors. Curtailment during drought demands would occur in accordance to the rules and regulations governing the use of water during a water supply storage, as contained in the City's Ordinance 92-10, An Ordinance of the City Council of the City of Santa Cruz Prohibiting and Regulating Certain Uses of Water From the City Water Supply System not Essential to the Public Health and Well-being for Water Conservation Purposes.

Desalination Facility Components

The desalination facility would consist of a 2.5 mgd Desalination Plant, conveyance facilities, and associated appurtenances. The relevant components are discussed in order of the desalination process, as water is taken from the ocean, treated, and distributed. Specifically, these facilities are the raw water intake system, raw water intake pipeline, desalination plant, treated water distribution pipeline, and the brine discharge pipeline. A description of the Alternative D-2 conveyance facilities is also provided.

Raw Water Intake System

The City would modify the City's existing wastewater outfalls to maximize use of existing infrastructure, reduce construction and cost, and minimize impacts to the ocean floor. The City proposes to convert the existing, abandoned 36-inch, emergency wastewater outfall to an intake structure. Following the installation of the new 72-inch WWTP outfall in the late 1980's, the existing 36-inch outfall was abandoned and is currently used for emergency events only. The 36-inch outfall extends from a junction structure located near the intersection of West Cliff Drive and Sunset Avenue, and then extends approximately 2,000 feet south into the Pacific Ocean, at a final depth of approximately 40 feet below mean sea level. Conversion of the existing outfall system to an intake system would require installation of screen / baffles at the end of the outfall to allow water intake, installation of a new lining within the existing pipe, and modifications of the junction structure. Figure 2 shows the location of the existing, emergency outfall and the junction structure.

TABLE 1
CITY OF SANTA CRUZ INTEGRATED WATER PLAN PROGRAM EIR COMPONENTS

PROJECT COMPONENTS	ALT. D-1	ALT. D-2
Water Conservation (City only) Residential Programs: Ultra-Low Flush Toilet (ULFT) Rebates, High Efficiency Clothes Washer Rebates, Conservation Kit Distribution, Plumbing Fixture Retrofit Ordinance, Residential Water Surveys, Apartment Building Sub-meters, New Construction Ordinance Non-Residential Programs: Commercial ULFT Rebates, Commercial, Industrial, and Institutional Water Surveys, Large Landscape Water Use Review, Parks Water Use Review, Large Landscape Budget-Based Rates	X	X
Water Curtailment (City only) 15% reduction – Water management tool that would allow for response during infrequent shortages rather than entirely eliminate future shortage	X	X
Raw Water Intake and Appurtenances Conversion of the City's existing emergency wastewater outfall for use as raw water intake; modifications to the existing junction structure at the beach near the intersection of West Cliff Drive and Sunset Avenue; pumping facilities at the raw water intake	X	X
Raw Water Pipeline Raw water intake pipelines between the ocean and the Desalination Plant	X	X
Desalination Plant 2.5 mgd Desalination Plant (expandable to 4.5 mgd), consisting of treatment, pumping, and storage facilities	X	X
Treated Water Distribution Pipeline Treated water distribution pipelines from the Desalination Plant to Bay Street Reservoir	X	X
Brine Discharge Pipeline Brine discharge pipelines between the desalination plant and WWTP or existing wastewater outfall	X	X
Brine Discharge Modifications Modification of the City's existing wastewater outfall to accommodate brine discharge; modifications to the existing junction structure at the beach near the intersection of West Cliff Drive and Sunset Avenue	X	X
D-2 Conveyance Facilities (between the City and SqCWD) and Appurtenances Pipelines between the City's service area and that of SqCWD; associated pump station(s); modifications to existing distribution systems to include interconnections, as necessary; potential upgrade of existing SqCWD pipelines		X
D-1 Desalination Plant Operation Non-Drought – Desalination Plant would not be in operation. Drought – Desalination Plant would be operated to supplement the City's peak demands ***D-2 Desalination Plant Operation*** Non-Drought – Desalination Plant would be operated (as determined by Operations Agreement between the City and SqCWD) to meet existing and future demands of SqCWD in order to ameliorate overdrafting of the Purisima Aquifer. Drought– SqCWD would not receive any water from the Desalination Plant, unless excess capacity is available	X X	X X

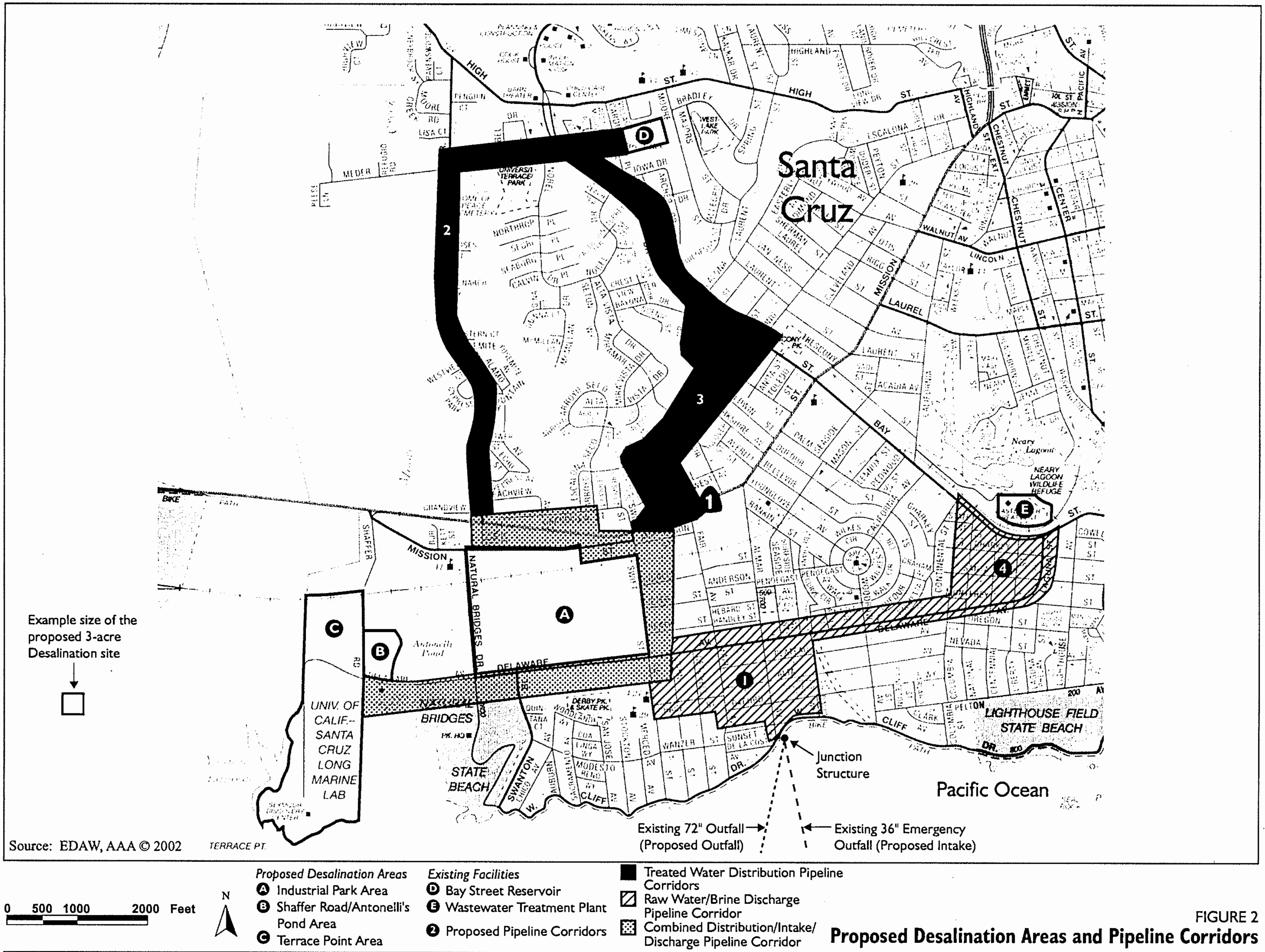

FIGURE 2
Proposed Desalination Areas and Pipeline Corridors

A booster pump station would be installed at the raw water intake site to pump raw water to the desalination plant. The number, capacity, motor rating, and noise levels of the pumps would be determined as design of the facility progresses. The pump station would be fully enclosed and equipped with residential-rated noise attenuation to ensure compliance with relevant noise standards.

Modification of the junction structure and existing outfall would require closure of portions of the Beach (near the intersection of West Cliff Drive and Sunset Avenue) during construction activities and would require the installation of a temporary stairwell for beach access (as the existing junction structure currently provides beach access). Construction activities would occur during daytime hours only, Monday through Friday.

Raw Water Intake Pipeline (Corridor 1)

The raw water intake pipeline would connect the desalination plant to the seawater intake structure. The raw water pipeline would be up to 24-inches in diameter and convey ocean water to the desalination plant. Streets encompassed within the proposed pipeline corridors are shown in Table 2 and Figure 2.

The raw water pipeline would be located within public street right-of-ways, and would be installed parallel to the brine discharge pipeline to the extent feasible. Depending on the site and pipeline alignments selected, the length of the pipelines would be up to 15,000 linear feet. Generally, the corridors traverse industrial and residential uses, with intermittent public and park uses in the vicinity. Pipelines would likely be installed using a conventional cut and cover method, consisting of trench excavation along public roadways. A minimum construction easement width of 20 feet would be needed to accommodate pipe storage and to allow trucks and equipment access to the work area. The width of the construction easement may be wider where placement of more than one pipeline within a trench would be necessary. Pipeline installation may require traffic control and lane closures.

TABLE 2
STREETS ENCOMPASSED WITHIN THE RAW WATER PIPELINE CORRIDORS

Corridor 1
Delaware Street
Swift Street
Chace Street
Plateau Avenue
Alta Avenue
Oxford Way
Sunset Avenue
John Street
Getchell Street
Fair Street
Almar Avenue
West Cliff Drive

Desalination Plant

Plant Location

Figure 2 shows three alternative locations (denoted as Area A, B, and C) where the approximately three-acre desalination plant could be located. These areas were selected based on proximity to the intake and brine disposal facilities, available infrastructure and power supply, adequate space requirements, and consistency with surrounding land uses. The desalination plant design would be developed for each site based on size and shape of the parcels as well as other site-specific requirements. The alternative areas are discussed below:

- Industrial Park Area (Area A). The Industrial Park Area is bounded by Mission Street and the Union Pacific Railroad (UPRR) tracks to the north, Natural Bridges Drive to the west, Swift Road to the east, and Delaware Avenue to the South. The area consists of partially developed areas for manufacturing uses, as well as undeveloped lots and parcels. The majority of the undeveloped portions of the area has been disked and graded, and the Arroyo Seco Canyon drainage has recently been realigned. Areas considered for development of the Desalination Plant include undeveloped parcels and areas within the unoccupied buildings.

- Shaffer Road/Antonelli's Pond Area (Area B). The Shaffer Road/ Antonelli's Pond area is located between Shaffer Road and the Antonelli's Pond. Delaware Avenue and the Homeless Garden Project (a vegetable and flower garden) bound the property to the south and north, respectively. The plant could be sited in this area.

- Terrace Point Area (Area C). The Terrace Point Area is owned and managed by the University of California Santa Cruz (UCSC). UCSC is currently developing a Coastal Long Range Development Plan (LRDP) for the area. Younger Lagoon and agricultural fields are located west of the area. The Pacific Ocean, residential uses, and the railroad corridor are located to the south, east, and north, respectively. Terrace Point consists of nonresidential research facilities and currently undeveloped land.

Desalination Plant Components

The desalination plant (initial capacity of 2.5 mgd and ultimate capacity of 4.5 mgd) would generally consist of pre-treatment, treatment, pumping and storage facilities. The specific components would vary depending on the type of treatment processes selected. Pretreatment facilities would consist of membrane treatment technologies or conventional water treatment technologies, including granular media filtration, and disinfection. Desalination facilities would consist of reverse osmosis (RO) membrane technologies, brine equalization storage, and post-treatment facilities. The City may select a different process depending on the results of pilot studies, the available technology, cost, and water quality evaluation of the seawater. In addition to pretreatment and desalination facilities, the desalination plant would also include components typically associated with municipal water facilities such as chemical storage, administration facilities, vehicle parking / loading areas, electrical room, fencing, and lighting. The site layout would be developed based on the parcels selected. All buildings would be designed to integrate with the surrounding environment. All chemicals would be stored within appropriate secondary containment and would meet current regulatory requirements. The types and volumes of chemicals stored and/or utilized at the desalination facilities would be established as the design proceeds.

Construction of the proposed desalination plant would involve site clearing, excavation, foundation, and underground construction, construction of aboveground structures, paving, and restoration of the disturbed area / landscaping.

Power Supply

Approximately one megawatt of power per mgd of treatment plant finished water production is required for seawater desalination. This is equivalent to 18 to 20 kilowatt-hours per 1,000 gallons of water produced. To reduce the raw electricity demand, reject brine would be recycled in the energy recovery turbine prior to disposal to provide a supplemental power supply.

Operation

Operation of the Desalination facility would differ for the two alternatives. Under D-1, the proposed Desalination Plant would be operated only when peak-demands are not met by existing supply sources, as would occur during a drought. It is anticipated that full-time operation of the plant under a drought scenario would occur four percent of all days (based on a review of 59 years of hydrologic record). This translates to approximately 860 days of the 21,535 days in the 59-year period. These days may be clustered, but are not anticipated to be consecutive for the entire duration. Usage of the plant would occur during the dry and critically dry years, and primarily during the peak demand season (summer through autumn) when water demands are highest and water supplies are lowest. It is estimated that the plant would operated at a reduced capacity less than ten percent of all days within the 59-year period, which translates to less than 2,200 days over the 21,535-day period. Similar to the scenario described above, usage of the plant would likely occur during the dry or critically dry years, and primarily during the peak demand season.

Under D-2, the City would continue to operate the desalination facility during drought years. In addition, water would be available to SqCWD during non-drought conditions, unless surplus desalination plant capacity is available during drought events. If this program is implemented, joint operation of the desalination plant would be defined by the future Operations Agreement between the two agencies. The use of the Desalination Plant under D-2 would allow SqCWD to reduce pumping of the groundwater aquifer.

Treated Water Distribution Pipeline (Corridors 2 and 3)

The treated water distribution pipeline would connect the desalination plant to the City's existing potable water distribution infrastructure. Two corridors provide alternative options for pipeline routing. Streets encompassed within the proposed pipeline corridors are shown in Table 3 and Figure 2.

TABLE 3
STREETS ENCOMPASSED WITHIN THE TREATED WATER DISTRIBUTION PIPELINE CORRIDORS

Corridor 2	Corridor 3
Cardiff Place	Iowa Drive
Cardiff Court	Cardiff Place
Bay Street	Bay Drive
Meder Street	Bay Street
Western Drive	Escalona Drive
Mission Street	Anthony Street
	Kenneth Street
	Olive Street
	King Street
	Mesa Lane
	Mission Street
	Swift Street
	Delaware Avenue

Both corridors are located primarily along public right-of-ways, through residential, commercial, and industrial uses. The distribution pipeline would be up to 20-inches in diameter, and would be up to 15,000 linear feet, depending on the desalination site and specific pipeline alignments selected. Specific intersections and crossings, including Highway 1 and the railroad tracks, may require nighttime construction activities to reduce the impact on traffic congestion or special construction techniques to avoid traffic-related impacts or other sensitive resources. Construction techniques would be similar to those described above. Pipeline installation within residential areas would typically occur only during the daytime hours from Monday through Friday.

Brine Discharge Pipeline (Corridors 1 and 4)

The brine discharge pipeline would connect to either the existing 72-inch City wastewater outfall pipeline on the landward side of its discharge point near the intersection of West Cliff Drive and Sunset Avenue, or at the Santa Cruz City Waste Water Treatment Plant (WWTP). The brine discharge pipeline would be up to 24 inches in diameter. Streets encompassed within the proposed pipeline corridors are shown in Table 4 and Figure 2.

The brine discharge pipeline would be located within public street right-of-ways, and would be installed parallel to the raw water intake pipeline to the extent feasible. Depending on the site and pipeline alignments selected, the length of the pipelines would be up to 15,000 linear feet. Generally, the corridors traverse industrial and residential uses, with intermittent public and park uses in the vicinity. Construction techniques would be similar to those described above. However, the width of the construction easement may be wider due to the placement of more than one pipeline within a trench.

TABLE 4 STREETS ENCOMPASSED WITHIN BRINE DISCHARGE PIPELINE CORRIDORS	
Corridor 1	**Corridor 4**
Delaware Street	Delaware Avenue
Swift Street	Columbia Street
Chace Street	National Street
Plateau Avenue	Centennial Street
Alta Avenue	Liberty Street
Oxford Way	Laguna Street
Sunset Avenue	Monterey St.
John Street	Santa Cruz St.
Getchell Street	Gharkey St.
Fair Street	Bay Street
Almar Avenue	
West Cliff Drive	

[a] The streets associated with Corridor 4 would be applicable only if the brine is disposed via the WWTP.

Brine Discharge System

Two options are available for the disposal of brine from the desalination process. Both would require ultimate discharge via the City's existing 72-inch wastewater discharge outfall to allow for dilution prior to disposal. The landward terminus of the existing 72-inch outfall is located within the junction structure at the beach near the intersection of West Cliff Drive and Sunset Avenue (see Figure 2); the outfall subsequently extends more than two miles on the ocean bottom and terminates one mile offshore into the Pacific Ocean, at a depth of approximately 110 feet below mean sea level. Currently, the pipeline discharges on average 10 mgd of wastewater effluent into the ocean, has a design capacity of 17 mgd, and has space for up to 23 mgd total capacity (Carollo Engineers, March 2002). Wastewater is discharged in accordance with Santa Cruz Public Works' National Pollutant Discharge Elimination System (NPDES) requirements. Discharge of the combined brine and wastewater effluent would require modification of the existing NPDES permit. The two alternative connections include the outfall landward of the junction structure, or at the WWTP.

Alternative D-2 Improvements (Conveyance and Pumping Facilities) (Corridors 5, 6, and 7)

In addition to the facilities described above, transmission pipelines would be required to convey water from the City's service area to that of SqCWD. Potential pipeline corridors are shown in Table 5 and Figure 3. The proposed pipelines have a diameter of up to 20-inches, and length of up to 20,000 linear feet. Construction techniques would be similar to those described above. Additional improvements to SqCWD's existing, potable water distribution system may be required. A proposed booster pump station would also be required. The number of pumps, capacity, and motor rating would be determined as design of the facility progresses. The pump station would be fully enclosed and equipped with noise attenuation to ensure compliance with relevant noise standards.

TABLE 5
STREETS ENCOMPASSED WITHIN THE ALTERNATIVE D-2 PIPELINE CORRIDORS

Corridor 5	Corridor 6	Corridor 7
Soquel Avenue	Soquel Avenue Capitola Avenue	Ocean Street East Cliff Drive Murray Railroad ROW 41st Avenue

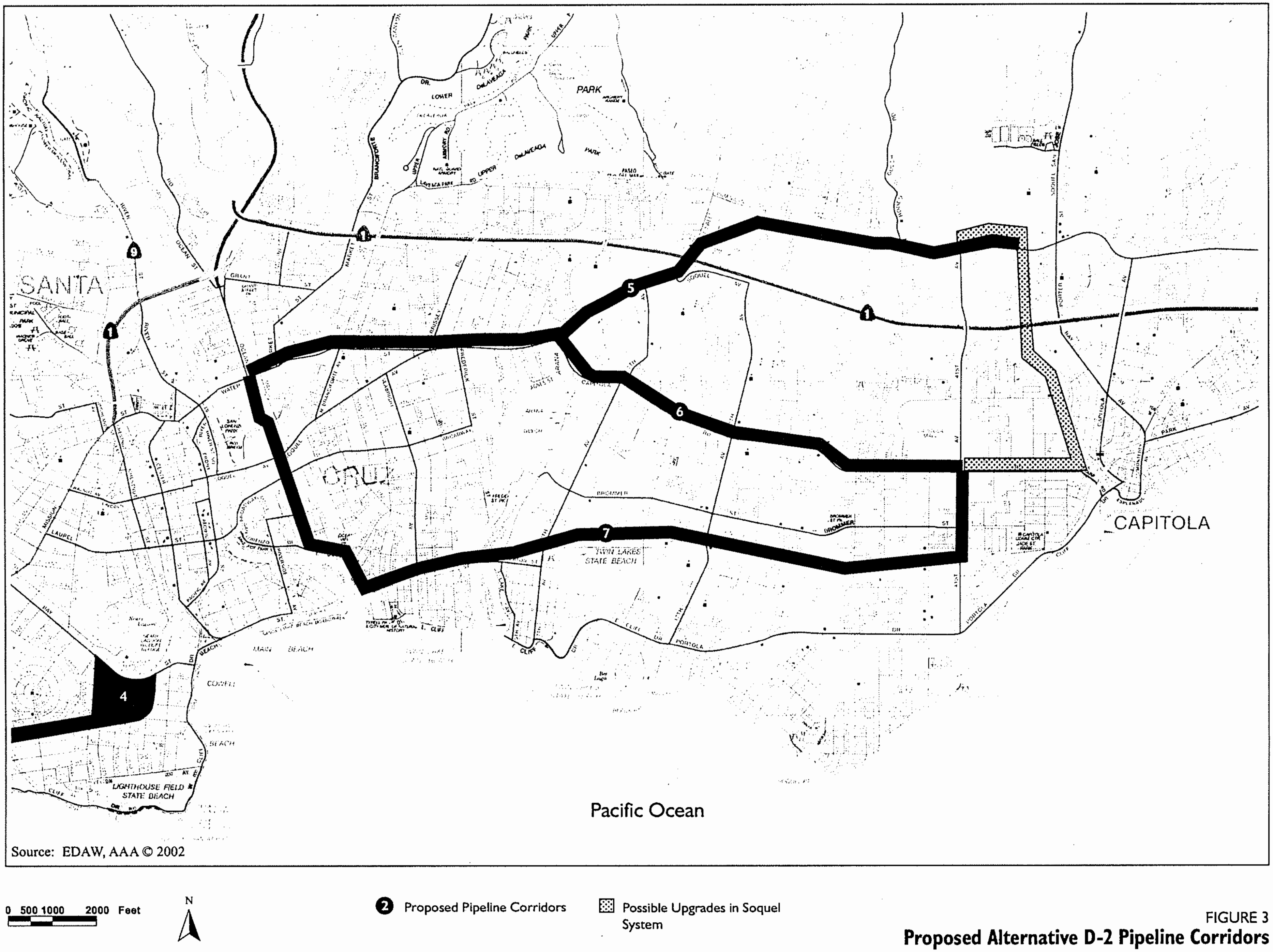

FIGURE 3
Proposed Alternative D-2 Pipeline Corridors

References

Gary Fiske & Associates, City of Santa Cruz Integrated Water Plan, Draft Final Report, June 2003

Carollo Engineers, City of Santa Cruz / Soquel Water District Alternative Water Supply Study, Evaluation of Regional Water Supply Alternatives, Final, March 2002.

Soquel Creek Water District, Public Outreach Presentation, 2003.

SANTA CRUZ WATER DEPARTMENT
INTEGRATED WATER PLAN PROJECT
Public Scoping Comments

November 13, 2003

Oral and written comments were received during the Scoping Meeting. These issues and concerns are differentiated by the following categories:

Groundwater-related Issues

- How are pumping limits determined?
- Will an increase to Beltz Wells require a negative declaration?
- Consider interconnections related to groundwater pumping.
- Examine regional impacts to the aquifer from changes in groundwater pumping procedure.
- What are the impacts to wetlands from pumping at Beltz Wells?
- How are salt water intrusion and subsidence being considered?
- Consider modeling of the water table.
- How will change in groundwater table impact habitat, birds, steelhead, wetlands, and tidewater gobi?
- Is it possible to reach an agreement on management of the Purisima Aquifer without the IWP? How can management of the Purisima be achieved more fully?
- What are the positive effects of resting the aquifer?
- How can the aquifer be enhanced and supply be increased through watershed management?

Water Quality / Marine Resources

- Consider minimum inflow speed of salt water to minimize impingement and entrainment of flora and fauna.
- Spell out in numbers the expected salinity of desalination plant outflow and the salinity of desalination outflow mixed with treatment plant effluent.
- Brine and treated wastewater synergistic effects with respect to existing contaminants and microbiology in both the brine and wastewater.
- What are the cumulative effect of brine?

- How will the formation of the effluent solution affect its properties and the properties of the ocean?
- Could the contact time in the pipeline allow for microbiological growth or formation of toxic chemicals?
- How does the range of salinity values in the discharge water compare to seawater? What are the precise values?
- What diameter (intake) pipeline is required for no impact to the marine environment?

Growth Inducement

- Is provision of a desalination plant growth inducing for the area serviced by SqCWD?
- How will the brine impact the current contaminants when it is mixed with the wastewater?
- How will an additional water supply (desalination) induce growth?

Alternative Sources of Energy

- Address environmental effects of solar, wind and other renewable energy sources as power supply for desalination plant.
- Please consider alternative energy sources in comparing environmental and fiscal effects of energy uses (e.g., solar array vs. grid)
- Is the City considering alternative energy sources for the desalination plant?

Desalination Facility Siting and Operation

- How were the desalination sites chosen? What are the criteria to determine the best alternative site? What is the process for determining how a site is used?
- What are the impacts to geology under the desalination sites?
- How many workers will be involved during construction and operation? How long will the construction period last?
- How will water be distributed into the system?
- Desalination water is hotter than ambient temperature. How will it be cooled before being put into Bay Street Reservoir?
- How will use of desalination plant affect operation of current surface water diversions during drought?

Alternatives of / to the Project

- Consider Cistern Water Storage for Commercial and Industrial accounts. Store water at point of Use.

- Is tertiary treatment considered and/or feasible? Why was it rejected as an alternative?

- Implement aboveground ("flume-like") pipes instead of buried pipelines?

- Does the project consider beach wells or other means of intake?

Regional Issues

- Sharing desalination water with SqCWD will cause them to change their pumping regime. How will their new pumping procedure affect the environment during a drought?

- Would Soquel Creek pump more water during a drought with the partnership than they currently pump during a drought?

Miscellaneous Issues

- Consider sliding scale curtailment (e.g., residents curtailed by 25%, and business curtailed by 15%).

- What is the definition of drought, and when would most severe curtailment occur?

- Will all comments be included in the EIR?

- Can the City make a summary of all comments available by the December 18th meeting?

- How does the outfall of the desalination plant compare to that of a power plant with respect to distance, size, and volume?

- Does CEQA and NEPA use the same guidelines

- What are the noise impacts from the project?

Gray Davis
Governor

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse

Tal Finney
Interim Director

Notice of Preparation

October 29, 2003

To: Reviewing Agencies

Re: City of Santa Cruz Integrated Water Plan
SCH# 2003102140

Attached for your review and comment is the Notice of Preparation (NOP) for the City of Santa Cruz Integrated Water Plan draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Linette Abbott
City of Santa Cruz
809 Center Street
Santa Cruz, CA 95060

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott M—

Scott Morgan
Associate Planner, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2003102140
Project Title City of Santa Cruz Integrated Water Plan
Lead Agency Santa Cruz, City of

Type **NOP** Notice of Preparation

Description The City prepared an Integrated Water Plan (IWP) (June 2003) that addresses the current / future drought-related crises as well as long-term water supply needs (through 2020). The purpose of the IWP is to help the City to reduce near-term drought year shortages, and provide a reliable supply that meets long-term needs while ensuring protection of public health and safety. The IW recommends desalination as a viable water supply alternative for further evaluation, along with conservation and curtailment components.

Lead Agency Contact

Name Linette Abbott
Agency City of Santa Cruz
Phone 831-420-5200 *Fax*
email
Address 809 Center Street
City Santa Cruz *State* CA *Zip* 95060

Project Location

County Santa Cruz
City Santa Cruz
Region
Cross Streets
Parcel No.
Township *Range* *Section* *Base*

Proximity to:

Highways 1
Airports
Railways UPRR
Waterways
Schools
Land Use

Project Issues Aesthetic/Visual; Air Quality; Archaeologic-Historic; Coastal Zone; Geologic/Seismic; Noise; Recreation/Parks; Toxic/Hazardous; Traffic/Circulation; Water Supply; Wetland/Riparian; Wildlife; Growth Inducing; Landuse; Cumulative Effects; Other Issues

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Reviewing Agencies Resources Agency; California Coastal Commission; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 3; Department of Fish and Game, Marine Region; Department of Health Services; Native American Heritage Commission; State Lands Commission; Caltrans, District 5; State Water Resources Control Board, Division of Water Quality; State Water Resources Control Board, Division of Water Rights; State Water Resources Control Board, Division of Loans and Grants; Regional Water Quality Control Board, Region 3

Date Received 10/29/2003 *Start of Review* 10/29/2003 *End of Review* 12/01/2003

Note: Blanks in data fields result from insufficient information provided by lead agency.

Resources Agency

- ■ **Resources Agency** Nadell Gayou
- ☐ **Dept. of Boating & Waterways** Suzi Betzler
- ■ **California Coastal Commission** Elizabeth A. Fuchs
- ☐ **Colorado River Board** Gerald R. Zimmerman
- ☐ **Dept. of Conservation** Roseanne Taylor
- ☐ **California Energy Commission** Environmental Office
- ☐ **Dept. of Forestry & Fire Protection** Allen Robertson
- ☐ **Office of Historic Preservation** Hans Kreutzberg
- ■ **Dept of Parks & Recreation** B. Noah Tilghman, Environmental Stewardship Section
- ☐ **Reclamation Board** Lori Buford
- ☐ **Santa Monica Mountains Conservancy** Paul Edelman
- ☐ **S.F. Bay Conservation & Dev't. Comm.** Steve McAdam
- ■ **Dept. of Water Resources** Resources Agency, Nadell Gayou

Fish and Game

- ☐ **Dept. of Fish & Game** Scott Flint, Environmental Services Division
- ☐ **Dept. of Fish & Game 1** Donald Koch, Region 1
- ☐ **Dept. of Fish & Game 2** Banky Curtis, Region 2
- ■ **Dept. of Fish & Game 3** Robert Floerke, Region 3
- ☐ **Dept. of Fish & Game 4** William Laudermilk, Region 4
- ☐ **Dept. of Fish & Game 5** Don Chadwick, Region 5, Habitat Conservation Program
- ☐ **Dept. of Fish & Game 6** Gabrina Gatchel, Region 6, Habitat Conservation Program
- ☐ **Dept. of Fish & Game 6 I/M** Tammy Allen, Region 6, Inyo/Mono, Habitat Conservation Program
- ■ **Dept. of Fish & Game M** Tom Napoli, Marine Region

Other Departments

- ☐ **Food & Agriculture** Steve Shaffer, Dept. of Food and Agriculture
- ☐ **Dept. of General Services** Robert Sleppy, Environmental Services Section
- ■ **Dept. of Health Services** Wayne Hubbard, Dept. of Health/Drinking Water

Independent Commissions,Boards

- ☐ **Delta Protection Commission** Debby Eddy
- ☐ **Office of Emergency Services** John Rowden, Manager
- ☐ **Governor's Office of Planning & Research** State Clearinghouse

____

- ■ **Native American Heritage Comm.** Debbie Treadway
- ☐ **Public Utilities Commission** Ken Lewis
- ■ **State Lands Commission** Jean Sarino
- ☐ **Tahoe Regional Planning Agency (TRPA)** Lyn Barnett

Business, Trans & Housing

- ☐ **Caltrans - Division of Aeronautics** Sandy Hesnard
- ☐ **Caltrans - Planning** Ron Helgeson
- ☐ **California Highway Patrol** Lt. Julie Page, Office of Special Projects
- ☐ **Housing & Community Development** Cathy Creswell, Housing Policy Division

Dept. of Transportation

- ☐ **Dept. of Transportation 1** Mike Eagan, District 1
- ☐ **Dept. of Transportation 2** Don Anderson, District 2
- ☐ **Dept. of Transportation 3** Jeff Pulverman, District 3
- ☐ **Dept. of Transportation 4** Tim Sable, District 4
- ■ **Dept. of Transportation 5** David Murray, District 5
- ☐ **Dept. of Transportation 6** Marc Birnbaum, District 6
- ☐ **Dept. of Transportation 7** Stephen J. Buswell, District 7
- ☐ **Dept. of Transportation 8** Linda Grimes, District 8
- ☐ **Dept. of Transportation 9** Gayle Rosander, District 9
- ☐ **Dept. of Transportation 10** Tom Dumas, District 10
- ☐ **Dept. of Transportation 11** Bill Figge, District 11
- ☐ **Dept. of Transportation 12** Bob Joseph, District 12

Cal EPA

Air Resources Board

- ☐ Airport Projects, Jim Lerner
- ☐ Transportation Projects, Kurt Karperos
- ☐ Industrial Projects, Mike Tollstrup

- ☐ **California Integrated Waste Management Board** Sue O'Leary
- ■ **State Water Resources Control Board** Jim Hockenberry, Division of Financial Assistance
- ■ **State Water Resources Control Board** Student Intern, 401 Water Quality Certification Unit, Division of Water Quality
- ■ **State Water Resouces Control Board** Mike Falkenstein, Division of Water Rights
- ☐ **Dept. of Toxic Substances Control** CEQA Tracking Center

Regional Water Quality Control Board (RWQCB)

- ☐ **RWQCB 1** Cathleen Hudson, North Coast Region (1)
- ☐ **RWQCB 2** Environmental Document Coordinator, San Francisco Bay Region (2)
- ■ **RWQCB 3** Central Coast Region (3)
- ☐ **RWQCB 4** Jonathan Bishop, Los Angeles Region (4)
- ☐ **RWQCB 5S** Central Valley Region (5)
  - ☐ **RWQCB 5F** Central Valley Region (5), Fresno Branch Office
  - ☐ **RWQCB 5R** Central Valley Region (5), Redding Branch Office
- ☐ **RWQCB 6** Lahontan Region (6)
  - ☐ **RWQCB 6V** Lahontan Region (6), Victorville Branch Office
- ☐ **RWQCB 7** Colorado River Basin Region (7)
- ☐ **RWQCB 8** Santa Ana Region (8)
- ☐ **RWQCB 9** San Diego Region (9)

- ☐ **Other** ______________________

MONTEREY BAY
Unified Air Pollution Control District
serving Monterey, San Benito, and Santa Cruz counties

AIR POLLUTION CONTROL OFFICER
Douglas Quetin

24580 Silver Cloud Court • Monterey, California 93940 • 831/647-9411 • FAX 831/647-8501

RECEIVED
NOV 03 2003

October 31, 2003

Linette Abbott
Deputy Director
City of Santa Cruz Water Department
809 Center Street
Santa Cruz, CA 95060

SUBJECT: NOP OF DEIR FOR INTEGRATED WATER PLAN

Dear Ms. Abbott:

The District has reviewed the referenced document and has the following recommendations for the air quality analysis:

1. The District uses consistency with the Air Quality Management Plan for the Monterey Bay Region (AQMP) to determine a water plan's impact on regional air quality (ozone levels). AMBAG should be contacted to prepare the consistency determination.

2. If project <u>or</u> cumulative traffic would cause LOS to decline from D or better to E or F, dispersion modeling should be undertaken to determine if carbon monoxide concentrations would violate ambient air quality standards at sensitive receptor locations.

3. Project operational and construction PM_{10} emissions should be quantified. If emissions would exceed 82 lb/day, the project would have a significant impact on air quality. However, PM_{10} modeling could be undertaken to verify or dispute this finding per the District's CEQA Air Quality Guidelines.

4. If the project might expose sensitive receptors in adjacent land uses to air quality problems such as odors or toxic air contaminants (e.g., diesel exhaust during construction), the DEIR should include an assessment of these impacts.

5. Mitigation measures should be identified for any significant impacts on air quality. The EIR should quantify the emission reduction effectiveness of each measure, identify agencies responsible for implementation and monitoring, and conclude whether mitigation measures would reduce impacts below significance levels.

6. District permits which would be required should be identified.

The Disttrict's <u>CEQA Air Quality Guidelines</u> may be used to help prepare the air quality

The Disttrict's CEQA Air Quality Guidelines may be used to help prepare the air quality analysis. The Guidelines were recently amended, and an updated copy is available at the District's website - www.mbuapcd.org. Please do not hesitate to call if you have any questions.

Sincerely,

Janet Brennan

Janet Brennan
Supervising Planner
Planning and Air Monitoring Division

c: Todd Muck, AMBAG

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
333 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94105-2197

Regulatory Branch NOV 0 4 2003

SUBJECT: File Number: 28304S

Ms. Linette Abbott
City of Santa Cruz
Water Department
Deputy Director
809 Center Street
Santa Cruz, California 95060

Dear Ms. Abbott:

This letter is in response to your request for comments on the October 28, 2003 Notice of Preparation of an Environmental Impact Report for the City of Santa Cruz Water Department Integrated Water Plan that was received on October 29, 2003. Your project is located near the Moore Creek and the Pacific Ocean in the City of Santa Cruz, Santa Cruz County, California. Since this water plan may lead to the placement of fill into waters of the U.S. (i.e., wetlands, creeks, and the ocean) through the construction of a desalinization plant and installation or modification of outfall and intake structures, the Corps of Engineers will need to review those portions of your project.

All proposed work and/or structures extending bayward or seaward of the line on shore reached by: (1) mean high water (MHW) in tidal waters, or (2) ordinary high water in non-tidal waters designated as navigable waters of the United States, must be authorized by the Corps of Engineers pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). Additionally, all work and structures proposed in unfilled portions of the interior of diked areas below former MHW must be authorized under Section 10 of the same statute.

All proposed discharges of dredged or fill material into waters of the United States must be authorized by the Corps of Engineers pursuant to Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344). Waters of the United States generally include tidal waters, lakes, ponds, rivers, streams (including intermittent streams), and wetlands.

Your proposed work appears to be within our jurisdiction and a permit may be required. Application for Corps authorization should be made to this office using the application form in the enclosed pamphlet. To avoid delays it is essential that you enter the File Number at the top of this letter into Item No. 1. The application must include plans showing the location, extent and character of the proposed activity, prepared in accordance with the requirements contained in this pamphlet. You should note, in planning your work, that upon receipt of a properly completed application and plans, it may be necessary to advertise the proposed work by issuing a Public Notice for a period of 30 days.

If an individual permit is required, it will be necessary for you to demonstrate to the Corps that your proposed fill is necessary because there are no practicable alternatives, as outlined in the U.S. Environmental Protection Agency's Section 404(b)(1) Guidelines. A copy is enclosed to aid you in preparation of this alternative analysis.

Should you have any questions regarding this matter, please call Tyson S. Eckerle of our Regulatory Branch at 415-977-8717. Please address all correspondence to the Regulatory Branch and refer to the File Number at the head of this letter.

Sincerely,

Edward A. Wylie

Edward A. Wylie
Chief, South Section

Enclosures

AMBAG
ASSOCIATION OF MONTEREY BAY AREA GOVERNMENTS

RECEIVED
NOV 1 7 2003
CITY OF SANTA CRUZ
& WATER DEPT.

November 13, 2003

Ms. Linette Abbott
City of Santa Cruz
809 Center Street
Santa Cruz, CA 95060

Re: MCH # 110331 – Notice of Preparation of Environmental Impact Report for City of Santa Cruz Water Department Integrated Water Plan

Dear Ms. Abbott:

AMBAG's Regional Clearinghouse circulated a summary of notice of your environmental document to our member agencies and interested parties for review and comment.

The AMBAG Board of Directors considered the project on **November 12, 2003** and has no comments at this time.

Thank you for complying with the Clearinghouse process.

Sincerely,

Nicolas Papadakis
Executive Director

State of California—Health and Human Services Agency
Department of Health Services
Northern California Drinking Water Field Operations Branch
Monterey District

California Department of Health Services

DIANA M. BONTÁ, R.N., Dr. P.H.
Director

ARNOLD SCHWARZENEGGER
Governor

November 17, 2003

Linnette Abbott, Deputy Director
City of Santa Cruz Water Department
809 Center Street
Santa Cruz, CA 95060

Title: Notice of Preparation of an EIR for the City of Santa Cruz Water Department Integrated Water Plan

Dear Ms. Abbott:

The Department of Health Services, Drinking Water Field Operations Branch, Monterey District office (Department), has received and reviewed the Notice of Preparation of an Environmental Impact Report for the City of Santa Cruz Water Department Integrated Water Plan. The Department provides the following comments:

1. The desalination treatment facilities will be required to comply with the State's Surface Water Treatment Regulation (SWTR), with review and permitting by the Department. The Hydrology/Water Quality evaluation in the EIR should include evaluation of a full watershed sanitary survey (WSS) of the source water. The WSS is required prior to Department approval of any new surface water source and will allow the Department to determine the overall pathogen reduction requirements for the source water and evaluate the ability of the treatment process to remove any chemical contaminants.

   The WSS should identify and describe all sources of actual or potential contamination affecting the intake including but not limited to: ocean outfalls (specify the degree of wastewater treatment and disinfection); river, creek and drainage outlets (describe the watershed and the amount of flow); points of urban and agricultural runoff; marinas, docks, ship channels and mooring areas (describe control measures to prevent dumping of wastes from boats) and sewage pump stations; and the occurrence of biotoxins in the source water.

   The watershed boundaries should be fully delineated, to include the contributing area to the intake under all water current conditions, as well as the watershed for all fresh water flows into the contributing area. The WSS should evaluate the possible changes in sources of contamination due to known or potential changes in growth, development or industry within the watershed boundaries

   The WSS should also include a full characterization of the source water quality. The source water characterization should begin with the implementation of monitoring for coliform and pathogens in the vicinity of the planned intake. Additionally, full chemical monitoring of the source water should be initiated. Identification of toxins associated with algae blooms that may be present around the intake should be conducted. A compilation of the watershed water quality data gathered by other agencies for the Monterey Bay should be included in the evaluation. The characterization should include special monitoring to identify any impacts from major storm events.

It is recommended that a plan for conducting the WSS and source water characterization be provided to the Department for review and comment prior to implementation.

2. The EIR should evaluate the impact of the ocean wastewater outfall on the intake water quality. Modeling studies of the wastewater effluent plume under all water current conditions, at the maximum outfall capacity of 23 MGD should be undertaken. The actual pathogen concentrations in the outfall wastewater stream should be considered, including an evaluation of the pathogen survivability in ocean water and their transport under all water current conditions.

3. The various options for disinfection treatment should be evaluated in the EIR, considering chemical transport and storage, options for onsite generation of ozone, and clearwell capacity requirements. An evaluation of disinfection by-product formation issues, depending on the type of disinfection treatment to be provided, should be included to ensure compliance with the Stage 2 Disinfection By-Products Regulation.

4. The impact of multiple sources of water in the distribution system should be addressed and the possible resulting water quality problems should be evaluated in the EIR. Mitigation strategies should be proposed.

5. The EIR should evaluate the reliability of the power supply to ensure availability during high water demand periods when there is also a high consumer demand for electric power.

Thank you for the opportunity to comment on the Notice of Preparation. Notices regarding the availability of the draft EIR should be sent to our Monterey District office. If you have any questions regarding these comments, please contact me at (831) 655-6933.

Sincerely,

Betsy Lichti

Betsy S. Lichti, P.E.
District Engineer, Monterey District
DRINKING WATER FIELD OPERATIONS BRANCH

BSL/bl

cc: SDWSRF Environmental Coordinator
Santa Cruz Environmental Health
Laura Brown, General Manager, Soquel Creek Water District

REWATER
SYSTEMS, INC.

2085 Waterbury Circle
Chula Vista, CA 91913
Phone/Fax (619) 421-9121
www.rewater.com

November 19, 2003

Deputy Director Linette Abbott
Santa Cruz Water Department
809 Center Street, Room 10
Santa Cruz, CA 95060

Re: Public Comment on Desalination

Dear Deputy Director Abbott:

Please accept this comment letter in your department's consideration of cost-effective and environmentally superior alternatives to desalination.

I formed ReWater Systems, Inc., (ReWater) in 1990 while participating in the California Ad-Hoc Graywater Committee, co-chaired by the California Department of Water Resources (DWR) and Department of Health Services (DHS), and ReWater has grown to be the largest manufacturer of greywater reuse irrigation systems in the US. ReWater also installs such systems under state contractors license #798547, C-27 Landscaping.

In 1990, ReWater analyzed over 535 studies on greywater from around the world, and supplied those studies to DWR when it began writing the state greywater code in 1992 per my Assemblyman's Assembly Bill #3518 (Sher, Palo Alto). Since then, there have been numerous studies on greywater, the most notable being by the City of Los Angeles (1992), which is cited in the code, by the City of Brisbane, Australia (1994), by Krey H. Price, M.S., UC Berkeley (1996), the prestigious American Water Works Association's (AWWA) National End Use Survey (1996), DWR's own 1996 study of three systems, and the City of San Diego's 2003 analysis of their greywater pilot program.

For the purposes of this letter, and per California's greywater code, Appendix G of the California Plumbing Code, aka Division 5, Title 24, California Administrative Code, greywater is shower, tub, bathroom sink, laundry water, and similar water that has not been contaminated by other wastewater sources.

According to the American Water Works Association's 1998 End-User Survey of over 1,800 homes, a typical person produces 39.1 gallons of greywater per day. An average Single Family Dwelling (SFD) has 3.2 people in it, which results in the production of 125 gallons of greywater per day. This equals 45,668 gallons of greywater per year per home. In a legal greywater system, this water is then used in underground drip irrigation.

According to a 1998 US Department of Agriculture (C.R. Camp) analysis of all available studies on underground drip irrigation, underground drip is at least 30% more efficient than spray irrigation. According to the Irrigation Association, virtually all California residences (96.3%) use sprinklers for irrigation. Under the state greywater code, all greywater must be used underground, and drip irrigation is the preferred method of distribution. Drip's 1.3 efficiency multiplier means there is 59,369 gallons of greywater available per year per SFD, and much more at apartment buildings, condominiums, and other multi-family dwellings (MFD).

According to DWR and most water agencies, about half of all water used in urban California is used for landscape irrigation. Coincidently, the average SFD uses approximately the same amount of water for irrigation as is produced by a greywater reuse system.

As for cost-effectiveness, the City of Chula Vista used the State Water Resources Control Board's (SWRCB) cost-benefit equation, which was designed for traditional reclamation projects that capitalize all costs up-front instead of as constructed over time, as is the case with greywater systems, and still came up with greywater costing $560 per acre-foot (AF), slightly less than the retail price of freshwater. This resulted in a cost-benefit break-even point (1.0) with greywater going into only a typical sized front yard. With greywater going into a typical sized backyard too, the cost benefit ratio increased to 1.4.

MFD landscapes are much larger, and MFDs produce much more water at virtually the same cost as a SFD, thus MFDs have even better ratios. A ratio expected at a 10+ unit apartment building can be expected to exceed 10, if there is enough property on-site to irrigate.

To arrive at greywater's cost of $560 per AF, as explained in the SWRCB's approved State Revolving Fund (SRF) loan to Chula Vista, and as detailed in Chula Vista's latest Proposition 13 request to DWR for funding, Chula Vista factored in only some of greywater's values as a water source and only some of the savings it causes as a wastewater reduction method. They were unable to factor in other significant savings for the reasons explained below.

Chula Vista was unable to factor in any savings from the three layers of water purveyors selling water to Chula Vista, the Metropolitan Water District of Southern California, the San Diego County Water Authority, and the Otay Water District, because those agencies consistently refuse to recognize savings they receive due to greywater reuse. Their savings come from reduced water acquisition capital and finance costs, reduced pre-treatment costs, reduced pumping and other O&M costs, and reduced emergency storage capital and finance costs. Collectively, their unrecognized savings, thus potential discounts towards new connection fees for homes using a reuse system, amount to as much as, or more than, Chula Vista's recognized savings from reuse.

If water agencies followed the intent of Article X of the California Constitution, and the government code sections that prohibit water districts from profiteering, greywater reuse would be incredibly more cost-effective than it already is. Instead, their intransigence promotes water wasting. Countless builders have told ReWater that, if there truly were a water shortage, water agencies would encourage and financially support greywater reuse, but they don't.

As a consequence, most builders don't build homes correctly to reuse greywater (or reclaimed water), thus those homes never reuse any type of water because retrofitting is almost never cost-effective. Every new home that gets built without a reuse system drives the cost of water up for everybody, and it wastes water via conventional irrigation methods, which drives it up again.

Chula Vista was, however, able to factor in some wastewater savings into their analyses. They passed a resolution lowering their sewer connection fee 25% for builders that contractually promise to install and use greywater reuse systems for irrigation. Chula Vista based their discount on the fact that many studies show, during peak summer irrigation demand, greywater systems reduce sewer discharges 50%, and during the low winter use period here, they still reduce sewer production by at least 25%.

Chula Vista will pay off the balance of their systems with a SWRCB SRF loan from the savings they receive by producing less sewage. Without a greywater system, greywater is combined with sewage, turning the whole flow into sewage, which then has to receive sewage treatment, costing $2,500 per million gallons. (FYI, the majority of those costs come from energy for pumping.)

Reducing sewer treatment also reduces the amount of toxic treatment chemicals, usually chlorine and sulfur dioxide, discharged into the environment. Such discharges have been proven to harm plant and marine life. Further, 100% of all available science shows that by placing surfactants, i.e., surface acting agents, found in soaps and detergents, into the soil, greywater irrigation is the only form of wastewater disposal that mitigates the numerous problems caused by surfactants. Such problems include causing reproductive damage in marine life. There is currently no dollar amount assigned to these benefits.

There are numerous cost benefits for non-point source pollution (run-off) prevention though. Urban irrigation run-off is the well-documented leading cause of water pollution on the coast, and greywater irrigation eliminates irrigation run-off due to its use of underground drip irrigation. There is currently no dollar amount assigned to these benefits, but recent Regional Water Quality Control Board rules are requiring expenditures for run-off pollution mitigation. Chula Vista's analysis did not include these monetary values, though they did subtract for the incremental expense of installing underground drip irrigation.

When considering all the problems that greywater reuse irrigation systems solve - all of which desalination will only exacerbate – it becomes evident that these systems are environmentally superior to desal. It is no wonder that every environmental organization strongly supports greywater irrigation. CEQA requires any agency considering desalination to consider greywater through the EIR process (Pub. Resources Code § 21166, Guidelines, §§ 15162, 15163).

I trust you will thoroughly consider greywater reuse and its benefits during this critical time of public study of desalination. Please feel free to call me on my cell phone at (619) 322-0141.

Sincerely,

Stephen Wm. Bilson
Chairman & CEO

11-19-03

RECEIVED
NOV 2 1 2003
CITY OF SANTA CRUZ
& WATER DEPT.

Linette Abbott, Deputy Director
Santa Cruz Water Dept.
809 Center St., Rm 102
Santa Cruz CA 95060

Dear Director Abbott:

I am writing you regarding the City of Santa Cruz's proposed Integrated Water Plan. I urge you to expand the scope of the Environmental Impact Report, in order to assess the impact of increased pumping of the Purisima Aquifer.

Furthermore, while I understand the financial straits that the City is in, I also urge you to invest in a larger desalinization plant—one capable of complementing the current 600 acre-feet/year pumping from the Purisima, rather than a smaller one which requires the City to increase pumping to 2000 acre-feet/year. This will prove to be a more long-term solution, for it will not increase the already-dangerous overdraft on the Purisima Aquifer.

I realize such a large-scale plant may be beyond the reach of the current budget, but this letter is simply to express one citizen's wish for long-term water solutions, and the willingness to fund them—even if it requires increased taxation.

Thank you for your time.

Yours truly,

Seth Atkinson

Seth Atkinson

116 Yosemite Ave
Santa Cruz, CA 95060

NOV 2 4 2003

19 NOV 2003

DEAR MS ABBOTT,

I AM WRITING TO EXPRESS MY CONCERN ABOUT THE PROPOSAL TO INCREASE THE PUMPING OF THE PURISIMA AQUIFER AS PART OF THE INTEGRATED WATER PLAN.

I HOPE THAT THE ENVIRONMENTAL IMPACT REPORT IS EXPANDED TO INCLUDE THE IMPACT OF THE INCREASED PUMPING — ON STREAMS, SALMON, AND SALTWATER INTRUSION — AND ALSO TO CONSIDER RE-SIZING THE DESALINIZATION PLANT BASED ON THE CURRENT (RATHER THAN THE EXPANDED) LEVEL OF PUMPING.

AS A RESIDENT OF SOQUEL WHO GETS MY WATER FROM BATES CREEK (A TRIBUTARY OF SOQUEL CREEK), THE ISSUE OF THE IMPACT TO YEAR-ROUND STREAM FLOW RATES IS ESPECIALLY IMPORTANT TO ME!

THANK YOU FOR YOUR CONSIDERATION,

TIM FURST
P O BOX 663
SOQUEL, CA 95073

RECEIVED
NOV 2 4 2003

20 November 2003

Linette Abbott, Dep. Dir.
Santa Cruz Water Department
809 Center Street. Room 102
Santa Cruz, CA 95060

Dear Ms. Abbott;

Soquel Creek borders my property on two sides. I have lived on this property since 1987 and am very concerned about its health, water volume, and ability to withstand civilizations encroachment.

I understand that the Santa Cruz Water Department is considering increasing pumping of the Purisima. I oppose this action. Once the water table is lowered and salt water is allowed to enter, then what?

There seems to be several alternatives; desalinization and water treatment. My understanding of desalinization process is that it uses vast amounts of energy. Tertiary water treatment would save the water we now have, clean it, and recyle it, instead of dumping it, sometimes untreated, into the Pacific Ocean. Initial costs are high, but long term, a viable and future thinking solution.

Sincerely,

William W. Webb

William W. Webb
4719 Soquel Creek Road
Soquel, CA 95073
Tel/Fax 831-462-9513
billsoquel@peoplepc.com

Bill Kocher

From: Ed Porter
Sent: Monday, November 24, 2003 5:08 PM
To: Bill Kocher
Cc: 'Booth. Dana'; Ed Porter; Mark Primack; Mike Rotkin; Timothy Fitzmaurice
Subject: RE: Comment: Integrated Water Plan NOP - EIR

Hi Bill,

Here is a comment from a resident including conditions that should be evaluated in the EIR. (see his second paragraph).

Ed Porter
==

-----Original Message-----
From: Booth. Dana [mailto:BoothD@saccounty.net]
Sent: Friday, November 21, 2003 1:58 PM
To: eporter@ci.santa-cruz.ca.us; mprimack@ci.santa-cruz.ca.us; mrotkin@ci.santa-cruz.ca.us; tfitzmaurice@ci.santa-cruz.ca.us
Subject: Comment: Integrated Water Plan NOP - EIR

The NOP states on Page 2, "Hydrology (Surface and Groundwater): Implementation of the proposed program may have impacts to groundwater resources...." I could not concur more. And, that impact could be either beneficial or detrimental (depending on the capacity of the desal facility and its operating parameters).

My concern is if the desal plant is either undersized (to reduce initial costs) or under-utilized (to reduce operating costs). Either situation will most likely mandate additional demand on groundwater extraction that could result in aquifer loss through saltwater intrusion. It would be prudent during the EIR process to model (ModFlow) potential aquifer yields and establish a maximum rate, and emergency duration, that the aquifer can be mined before saltwater intrusion should be expected. And, once that rate/duration has been established, for the Board to institutionalize a "safe-yield" somewhat lower/shorter.

As a geologist in the groundwater field, I recognize the asset of groundwater. Ideally, the proposed desal facility could provide an opportunity for less aquifer demand (initially). Groundwater mining could easily be used as "peak protection" and increased (to the maximum established safe-yield) to meet Santa Cruz's growth needs between desal-facility upgrades. However, I would highly discourage any increased aquifer use until proper modeling can be performed.

Sincerely

Dana W. Booth, R.G.

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor

CALIFORNIA COASTAL COMMISSION

CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060
(831) 427-4863

November 24, 2003

Linette Abbott, Deputy Director
City of Santa Cruz Water Dept.
809 Center St.
Santa Cruz, CA 95060

Subject: ***Notice of Preparation of an Environmental Impact Report: City of Santa Cruz Water Department Integrated Water Plan (SCH# 2003102140)***

Dear Ms. Abbott,

Thank you for the opportunity to comment on the above referenced document. The project involves the analysis of the potential impacts associated with implementation of the City's Integrated Water Plan, which includes proposed development of a desalination plant, as well as conservation and curtailment programs. We have the following comments on the NOP; we will provide additional substantive comments when we have seen the DEIR:

- We recommend you review the draft Coastal Commission report on desalination and incorporate applicable issues from that report into the EIR. This report is available on our web site at www.coastal.ca.gov/energy/Th9b-8-2003.pdf. This report will be updated in December 2003. Also, please review the State Desalination Task Force report, which was issued in early October 2003, to identify a comprehensive set of issues to evaluate in the EIR. This report is available at www.owue.water.ca.gov/recycle/desal/desal.cfm.
- Among other issues, the EIR should evaluate potential project impacts on marine organisms and water quality, public access, visual impacts, impacts to environmentally sensitive habitats, recreation, etc.
- The EIR should include a comprehensive description of the growth-inducing aspects of the water augmentation options.
- The EIR should describe the brine discharge modeling method used and discuss its findings, including a description of the "worst case" scenario of brine salinity from desal facility operations.
- The EIR should evaluate the cumulative environmental impacts of the proposed desal facility in conjunction with other known and proposed desal facilities in the Monterey Bay area, as well as with other intakes and discharges from non-desal facilities (wastewater discharges, Monterey Bay Aquarium intakes and discharges, etc.) in the Monterey Bay area.
- Please note in the EIR that Proposed Desalination Areas B & C (as shown on Figure 2 of the NOP) are areas of deferred certification; thus, the Coastal Permit for any development on these sites would need to be issued by the Coastal Commission.

If you have any questions, please do not hesitate to call me at (831) 427-4863.

Sincerely,

Susan Craig

Susan Craig
Coastal Planner
Central Coast District Office

cc: Marcia Tobin
c/o EDAW, Inc.
150 Chestnut Street
San Francisco, CA 94111

Scott Morgan, State Clearinghouse

RITTENHOUSE BUILDING
AND
INVESTMENT ASSOCIATION

660 HIGH STREET
SANTA CRUZ, CALIFORNIA 95060
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& WATER DEPT.

November 24, 2003

City of Santa Cruz
Water Department

Attn: Linette Abbott, Deputy Director

Regarding: Your Letter dated October 28,2003 City of Santa Cruz Water Department Intergrated Water Plan.

Dear Ms. Abbott,

This letter is to respectfully inform the City Of Santa Cruz Water Department that the owners of Apn:003-071-19, 003-071-20, 003-022-15,003-071-11and 003-071-12 - Being Sylvia Rittenhouse Manson and Louis Emmet Rittenhouse have no interest what so ever in the sale of any part of the parcels listed above.

Sincerely,

Louis Rittenhouse

Cc: Sylvia Rittenhouse Manson

SIERRA CLUB

Santa Cruz Regional Group of the Ventana Chapter

P.O. Box 604, Santa Cruz, California 95061 (408) 426-4453

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CITY OF SANTA CRUZ
& WATER DEPT.

Ms. Linette Abbott, Deputy Director
Santa Cruz Water Department
809 Center Street, Room 102
Santa Cruz, CA 95060

November 21, 2003

Dear Ms. Abbott,

Responding to your recent IWP, we are concerned that the City of Santa Cruz wants to triple the output of the Beltz wells in Live Oak, creating an increase of the overall pumping of the Purisima Aquifer by 20% during drought conditions. The EIR must show the consequences of this pumping.

The IWP clearly states in its Evaluation Criteria, section IV-6, that:

> "...all supply strategies currently under consideration have the potential to impact this resource [meaning the Purisima Aquifer]."

But the City claims that this impact does not have to be considered in the EIR because they have historically used it at the proposed level of 2000 acre feet per year. This is specious reasoning. This historic usage was over twenty years ago, when human pressure on this resource was far lighter. Now the aquifer is being overdrafted by 600 acre feet per year–a completely different situation.

Under the California Environmental Quality Act (CEQA), the City must consider all adverse impacts upon this shared water resource. The proposed pumping would affect the Purisima Aquifer substantially. In the IWP section IV-6, the City even suggests that these effects would be positive for the aquifer:

> "Strategies that provide at least 2200 million gallons per

year to the Soquel Creek Water District have the potential to improve conditions and allow for water level recovery after the city and the district rely heavily on the Purisima in dry years."

How does the proposed use of desalinated water during wet years and resting the aquifer affect over-pumping of the aquifer in dry years? There is no data, only guesses; very likely only wishful thinking. We believe this strategy has the potential of significantly lowering the water table under the creeks and riparian areas during a drought. The EIR must also quantify these expected effects.

At the scoping hearing on November 13, 2003, Bill Kocher stated, "the effects in the Soquel area of the aquifer should be considered by the Soquel Creek Water District in a separate EIR."

According to CEQA law, a program EIR must consider the effects of the entire program. The aquifer is one system, and IWP is to affect it. You cannot separate the effects of this lowered water table in two separate EIRs. You cannot ignore these effects by not addressing them in this EIR.

This is a regional issue, not a district issue. The Purisima Aquifer is a single body, whose boundaries do not correspond to political ones. What is done to one part of it affects the whole. The City of Santa Cruz should not treat the question of effects on the Purisima Aquifer and the creeks it supports as if the southern boundary of Live Oak were the limit of these effects. It is not logical to divide the effects on the Purisima Aquifer into two separate EIRs. An EIR that would do this would be flawed and subject to legal challenge.

Because of the seriousness of the effects of the proposed water program on an already deeply overdrafted aquifer, we are also asking for an EIR that provides a proper water source alternative during drought–and alternative, under CEQA law, that does not require the use of the Purisima Aquifer beyond its current City extraction rate of 600 acre feet per year.

Sincerely,

Cherie L. Bobbe

Cherie L. Bobbe
Chair, Sierra Club Water Resource Committee, Ventana Chapter

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DEC 01 2003
CITY OF SANTA CRUZ
& WATER DEPT.

P.O. Box 1431, Soquel, Ca 95073

December 1, 2003

Linette Abbott, Deputy Director
Santa Cruz Water Department
809 Center Street, Room 102
Santa Cruz, CA 95060

Response to EIR Scoping for:
Santa Cruz Water Department Integrated Water Plan

Dear Ms. Abbott,

Friends of Soquel Creek is very concerned that the scope of the proposed EIR on the City of Santa Cruz Integrated Water Program (IWP) does not address the effects of this proposed program on the Purisima. We believe this is in violation of CEQA rules. The increased pumping of the Beltz Wells in Live Oak must be considered in the context of an already over drafted aquifer.

Our mandate as a community environmental nonprofit organization includes the protection of Soquel Creek as a habitat for native species. The summer base flow of Soquel Creek must be maintained if listed threatened and endangered species such as Steelhead Salmon, California Red Legged Frog, Yellow Legged Frog, and Tidewater Goby are to be saved. The proposed increase in water take during drought will compromise already reduced base flow in Soquel Creek as well as in all adjacent watersheds and waterways in Live Oak.

We note that an incomplete EIR is a waste of public funds and everyone's time is much better spent addressing our shared water problems than in arguing in a courtroom. The most recent similar case, the O'Neill well, proposed to be implemented without an EIR by the Soquel Creek Water District, specifically addressed aquifer impacts and was resolved in favor of a more complete environmental review.

Significant New Water Used in City Proposal

The Beltz well group in Live Oak draws out of the mid-county aquifer called the Purisima that supports Soquel Creek, Arana Gulch, and Rodeo Gulch and their coastal wetlands and lagoons. The City of Santa Cruz

City (City) proposes increasing the pumping on the Beltz Wells from 600 acre-feet to 1000 acre-feet/year (AFY) during normal rainfall years and 2000 AFY during drought years. Since "drought" is not a condition defined by the City of Santa Cruz by climatic conditions but on demand exceeding supply (which it already does), the larger amount can be extracted at any time with no other regulatory input. There is, in fact, no prohibition on its being extracted *every* year.

This increased use of the Live Oak wells is an integral part of the City's Integrated Water Plan. The potentially significant environmental effects of this portion of the IWP's assumptions cannot be ignored by the proposed EIR, which currently seems to be focused exclusively on the environmental effects of a desalinization project.

The Purisima is a shared basin. The Soquel Creek Water Department (SCWD) has determined that this aquifer is currently being overdrafted at a deficit rate of at least 600 AFY. Total Purisima pumping is currently estimated at ~7500 AFY, with the SCWD usage estimated at ~3600 AFY. An increase of +19% in aquifer extraction is a significant impact. The City of Santa Cruz's Integrated Water Plan could more than triple the Purisima's deficit during drought years. The possible joint increase in pumping by both the City and SCWD should be included in the scope of the EIR.

Integrated Water Program Assumptions
The Department wishes to use this water this without acknowledging any potential impacts or describing any aquifer management in the program EIR. The size of the desalinization plan being carefully scrutinized in the EIR is based on the assumption that the aquifer water will be taken at a rate of 1000 AFY during normal rainfall years and 2000 AFY during drought years. (Appendix Table B-1, Table B-2, Appendix Table C-3, and the CEQA checklist.)

The Historical Use Claim
Current and past effects of City use of the Beltz wells have never been surveyed. In the IWP, Section IV-6, the City claims a historical right to increased pumping:

> "The City has planned rehabilitation projects that will bring the City's Live Oak well and treatment plant capacity to 1 mgd (365 MG/year in normal years and 2 mgd (730 MG/year) in droughts. Although these figures are higher than those used in the Soquel Creek IRP, they are lower than historic pumping that occurred prior to the loss of production due to the 1989 Loma Prieta Earthquake."

This claim to huge pumping rights in the aquifer by historical use has the following problems:

- This historical claim is based on no presented evidence. Was the 2 mgd cited based on occasional extractions of that degree or on the average amount of extraction over a numbers of years? This critical information must be examined to justify any claim to historical pumping rates.
- No assessments were done for 1980's uses so that the impacts during past high pumping rate periods are unknown.
- CEQA does not grant exemptions to programs that could have a significant effect on the environment.
- Use of the Purisima aquifer has changed significantly. Over the last twenty years, increased urbanization has increased aquifer extraction and diminished aquifer recharge.

The record of all the pumping of all existing and former Beltz wells should be available in the EIR. This should be available on computer media for review by the public. Specifically, on which days was pumping at or greater than $2*10^6$ gal/day? During which years was pumping at or greater than 2000 acre-feet/year? If the City wishes to make a case for prior use, the information should have been presented for the EIR scoping comments. If the City wishes to exclude the potential effects on the Purisima from full EIR consideration, then they were obligated to present their expert information showing "no significant impacts" before this EIR scoping proceeding began.

Without presentation of expert study and conclusive data, examination of the pumping impacts cannot be cut from consideration in the Program EIR.

Purisima Hydrology: Where does the water come from?

The best science on the Purisima aquifer indicates that surface water in streams is captured by Purisima pumping.

Hedded Essaid published the results of an extensive computer simulation on the Purisima Aquifer in "Simulation of Freshwater and Saltwater Flow in the Coastal Aquifer System of the Purisima Formation in the Soquel-Aptos Basin, Santa Cruz County, California" (U. S. Geological Survey Water-Resources Investigations Report 91-4148, 1992). One of her conclusions was that:

> "Ground-water development in the basin has led to some decrease in the natural freshwater flow offshore. The predominate source for the water withdrawn, however, has been the capture of natural base flow. The cones of depression near the coast have modified

> the flow patterns in the basin, diverting to the production wells ground water that flowed under natural conditions to the streams. Thus, the amount of development that this basin can sustain is dependent on the quantity of base flow that can be captured by proper location of wells, and the resulting decrease in surface-water flow that is acceptable." (Page 33)

Lower summer flows (or base flow) of streams that could be affected by the City's pumping are those of Arana Gulch, Rodeo Gulch, and Soquel Creek and their riparian zones. Moran, Corcoran, and Schwann lagoons could have their summertime hydrology shifted.

This "new" water comes from somewhere. The EIR must show the potential effects of increased water capture. The probability is strong that that this water is taken from streams, forests, wetlands, and other surface uses.

Salt Water Intrusion:
The Purisima Aquifer is a shared resource among three state-chartered water districts, approximately 1000 private wells and eight private water companies, and all of the area's surface streams. If any portion of the aquifer is intruded by salt water, all users will be affected since the intruded portion is ruined as a water resource.

How low will the water table need to be at the coast to capture $2*10^6$ gal/day during a drought? Strong scientific evidence supports a conclusion that to capture 2000 AFY during a sustained drought, the City would need to lower the A, AA layer water heads to perhaps 50-100 feet below sea level at the coastline. Science has already established that a small flaw in the sealing claystone layer could allow significant salt water to flow into the freshwater aquifer and that very depressed coastline water heads hugely increase the risk of salt water intrusion.

Since the City's aquifer management could affect all users, the EIR must assess the probability of salt-water intrusion into the Purisima A and AA layers. Cumulative impacts for all users could include decreased water quality, decreased capacity to maintain their current usages and serious consequences to shared biotic resources such as our coastal lagoons and local streams.

SCWD Management Affects Live Oak Water Table Levels
Purisima management by Soquel Creek Water District strongly affects groundwater levels in Live Oak.

The Purisima is composed of a stack of sandstone beds with almost sealing layers of claystone between the beds. The Live Oak wells draw on water from the deepest layers that recharge mainly in Rodeo Gulch and Branciforte Canyon in the Santa Cruz Mountains. Most of the well output does not come from nearby surface recharge in Live Oak. The recharge mostly occurs into the deepest Purisima A and AA layer sandstones that surface on the western border of the Purisima Formation.

Since the available water flows from the mountains, the water table at the coast is dependent on the aquifer management of the intervening wells of the Soquel Creek Water District. In Live Oak, the surface layers cannot be significantly pumped, since seawater would intrude and ruin the pumping resource. Increased production from the deep A and AA layers in Live Oak depends on co-operation between the City and the SCWD. At present, the City does not have the well positions to independently capture the mountain water outflow.

The most probable place in the Purisima for salt-water intrusion is Live Oak, since the most permeable pumped layer, the AA, is closest to the surface at Live Oak. If the two water agencies fail to co-operate successfully and water tables are maintained at depressed levels for years at a time, Live Oak could be the first place in the Purisima to experience intrusion.

This is another reason why a full consideration of this aquifer is required in this EIR. The City cannot actually manage this resource without full co-operation and co-ordination with SCWD. This is true whether SCWD participates in the desalination project or not.

Prejudging Impacts Without Evidence

The IWP in Section IV-6 actually prejudges the effects of two large water agencies relying heavily on the Purisima in a drought:

> "Strategies that provide at least 2200 MG/year to Soquel Creek Water District have the potential to improve conditions and allow for water level recovery after the City and the District rely heavily on the Purisima in dry years."

Not a shred of expert evidence is offered in the IWP that this management strategy of dual agency dependence on the Purisima will "improve conditions." To estimate a potential impact, particularly those caused to an ecosystem by a lowered water table, explicit quantities must be stated. The City must present its evidence of improving the Purisima via this management in the Program EIR. These public trust issues by the statement, "These uncertainties will be resolved in future negotiations between the parties" (IWP IV-6)

The IWP completely ignores any potential environmental effects in the Hydrology (Surface and Groundwater) and Wetlands, Wildlife, and Plants of Purisima water extraction for Strategies D-1 and D-2 in Appendix C.

The Hydrology section states "This strategy would not utilize surface water or groundwater supplies or alter the operation of those supplies and therefore would have no impact." This bald statement is erroneous since assumptions in the IWP clearly show utilization of groundwater supplies and future alteration of the current operation of these supplies. The Wetlands, Wildlife and Plants section only considers the environmental impacts of the siting of a desalinization plant. There is no consideration of the effects on mid-county wetlands, wildlife and plants that would be affected by increased water take and a lowered water table in that area.

Will any strict agreements in the EIR preclude the City from taking more water than 2000 acre-feet/year? What criteria are used to decide when the increased take begins? How will the City define what a drought-needs is? How will the ecosystem impacts be estimated at the time of decision? How will they be mitigated if the impact is substantial?

Potential Ecosystem Extinctions and Other Detrimental Effects

- Tide water goby
- Steelhead salmon
- Various Live Oak wetland species
- Ecological system effects on Rodeo Creek, Arana Creek, and Soquel Creek
- The drought base flow in Soquel Creek that is essential for continued survival of its steelhead salmon run

What is needed to deal with these potentially serious issues is quantities, protocols, and management targets for the Beltz Well pumping; modeling that indicates the changed water table levels for the area with increased pumping; a determination of water levels that will not have negative environmental impacts and a commitment to achieving those levels; and biological surveys that estimate affected species and ecology resulting from the more severe drought-time hydrology

Determination of Significance and Cumulative Impacts to the Basin

The determination of significance is one of the key decisions in the CEQA process (CEQA Section 15064) This section provides that "if there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, the agency shall prepare a draft

EIR. This determination must be based to the extent possible on scientific and factual data and identify "direct physical changes in the environment which may be caused by the project and reasonably foreseeable indirect physical changes in the environment which may be caused by the project." [1]

The Lead Agency "shall consider the views held by members of the public in all areas affected as expressed in the whole record before the lead agency" and "shall also consider if the physical change causes adverse economic or social effects on people," and "whether the effects of the project are cumulatively considerable." "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.[2]

The Lead Agency cannot shield a portion of its Integrated Water Plan from environmental scrutiny in a Program EIR. A program EIR is required by law to examine all potential effects of all aspects of the plan. The City seems to claim that if effects do not occur within their political jurisdiction that they can leave the responsibility to other agencies for assessing the effects of their project.

Requests from Friends of Soquel Creek

The Integrated Water Plan's Program EIR should address the following issues:

1. Describe the pumping impacts on, and management plans for, the Purisima Aquifer by Santa Cruz City Water Department.
    a. What will be the environmental impact of potentially reduced stream flow due to increased Beltz Well pumping during extended drought to salmonids inhabiting Arana Gulch, Rodeo Gulch, and Soquel Creek watersheds?
    b. What would be the environmental impact of potentially reduced stream flow and lowered water table due to increased Beltz Well pumping during extended drought to wetland-dependent wildlife in Schwan Lagoon, Corcoran Lagoon, Moran Lake, and Capitola Lagoon?

[1] Authority cited: Sections 21083 and 21087, Public Resources Code. Reference: Sections 21003, 21065, 21068, 21080, 21082, 21082.1, 21082.2, 21083 and 21100, Public Resources Code; *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68; *San Joaquin Raptor/Wildlife Center v. County of Stanislaus* (1996) 42 Cal.App.4th 608; *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; *Laurel Heights Improvement Assn. v. Regents of the University of California* (1993) 6 Cal.4th 1112; and *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98.

[2] Authority cited: Sections 21083 and 21087, Public Resources Code; References: Sections 21084 and 21084.1, Public Resources Code; Wildlife Alive v. Chickering (1977) 18 Cal.3d 190; League for Protection of Oakland's Architectural and Historic Resources v. City of Oakland (1997) 52 Cal.App.4th 896; Citizens for Responsible Development in West Hollywood v. City of West Hollywood (1995) 39 Cal.App.4th 925; City of Pasadena v. State of California (1993) 14 Cal.App.4th 810; Association for the Protection etc. Values v. City of Ukiah (1991) 2 Cal.App.4th 720; and Baird v. County of Contra Costa (1995) 32 Cal.App.4th 1464

c. The EIR should demonstrate a commitment to a salt-water intrusion monitoring program and management program that indicates explicit groundwater levels and explicit pumping rate durations at the coastline that will protect the resource from seawater contamination with reasonable certainty.

d. Will any explicit agreements in the EIR preclude the City from taking *more* water than 2000 AFY? What criteria will be used to decide when the proposed increased take begins? How will the City define what a drought need is?

2. The issues discussed here indicate that the new supply project could need capacity to meet project projections. What would be the impact of an alternative new water supply project, sized so that Purisima pumping remains at the current level of 600 AFY, even during a drought?
3. The possible joint increase in pumping by both the City and SCWD should be included in the scope of the EIR.

In Conclusion

Friends of Soquel Creek believes that the proposed scope of the above EIR does not address the very real impacts of the Live Oak Beltz wells being pumped at 1000 AFY during normal rainfall years and 2000 AFY during a drought. Issues, which must be discussed, are

- The quantified effects upon the water table
- The environmental effects of increased pumpage and reduced base flow in local streams
- The environmental effects of reduced water available to local coastal wetlands
- The co-ordination of Purisima aquifer management by the Soquel Creek Water District and the City of Santa Cruz Water Department
- Assessment of the risk of sea water intrusion into the Live Oak area water table
- The evaluation of an alternative water project which does not increase aquifer pumping in Live Oak

If the above points are not addressed, Friends of Soquel Creek must consider the scope of the IWP Program EIR to be inadequate and incomplete.

Sincerely,
The Board of Directors
Friends of Soquel Creek

Katherine Sweet
Ned Spencer
Carla Christensen
Dr. David Walworth

Michael A. Guth
Attorney at Law
2-2905 East Cliff Dr.
Santa Cruz, CA 95062

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CITY OF SANTA CRUZ
& WATER DEPT.

Linnette Abbott
Santa Cruz Water Department
809 Center Street, Room 102
Santa Cruz, CA 95060

December 1, 2003

Ms. Abbott

I am writing this letter with regard to the Environmental Impact Report (EIR) for the City of Santa Cruz Integrated Water Plan (IWP). **The IWP is woefully inadequate in its description of potential impacts and incomplete in its presentation of information**. The EIR must consider further impacts other than those presented in the IWP. Further, the IWP is sufficiently incomplete in its presentation of information that certain worst case assumptions must be made when assessing impacts. If new information is to be added to the IWP to address the factual insufficiencies, public comment must be re-opened.

The proper way to proceed is to actually back up, and to update the IWP to address its insufficiencies before proceeding to the EIR. Absent this approach, worst case volume assumptions must be used when assessing the impacts of groundwater pumping. I fear that any EIR will be either forced to perhaps overstate impacts or be doomed to be rejected if taken to litigation. Once again, any modifications to the IWP to address the current omissions will require a new period of public review.

LIVE OAK WELLS

As a member of the community active in resource conservation, especially in the Live Oak region, **I was distressed to see that the IWP does not consider impacts from the increased pumping from the Live Oak (Beltz) wells.** The potential impacts on the mid-county coastal lagoons due to reduction or elimination of base flow must be considered. These lagoons are habitat to endangered and threatened species as well as to species of special concern to Santa Cruz County. The risk of saltwater intrusion to the

Michael A. Guth
Attorney at Law
2-2905 East Cliff Dr.
Santa Cruz, CA 95062

Purisima aquifer must be addressed. No clear information is given with regard to how much and when the Live Oak wells will be utilized, and the information that is given is in conflict. The repeated mention to historical pumping levels is not substantiated in any way. I do not believe that these levels can be substantiated. Further, in addition to the long time gap, which obviates any claims to exemption for continuation of a pre-existing use, the aquifer health and the status of its surface replenishment have changed significantly during the last two decades, so even if higher volume pumping did occur decades ago the return to such levels would have increased impacts.

PUMPING VOLUME

The IWP is incomplete and inconsistent in its description of pumping from the Live Oak wells and the Purisima aquifer.

Volume

The IWP refers to the Live Oak wells as a current source of supply at page II-2. In a footnote, it is stated that the City intends to restore this source to its "historical production level of 2 mgd." It does not state that this is to be a capacity level, but a **production level.** This conflicts with other portions of the IWP and is a critical element; other areas refer to this production level only in drought conditions (which has its own problems). This is over twice the current volume pumped on average by the City from these wells.

"Drought"

There are no specific criteria listed as to what constitutes a drought trigger for this IWP. Because no criteria are given, none can be assumed. Therefore, worst case is that the larger volume is always being pumped from the Live Oak wells. Any assumptions to the contrary in the EIR would require an update of the IWP, and a new period of review by the public.

Michael A. Guth
Attorney at Law
2-2905 East Cliff Dr.
Santa Cruz, CA 95062

IMPACTS

Appendix C of the IWP makes no assessment whatsoever of potential impacts of the proposed increased pumping from the Live Oak wells. With regard to wetlands impact, Table C-1 defers analysis to Table C-2. Table C-2 limits analysis to the Desalination Facility area and to the Distribution System. No assessment of potential impacts with regard to Live Oak well pumping is made with regard to wetlands, wildlife, or plants. In addition, the IWP plans to increase groundwater pumping in an overused aquifer when the aquifer and the environment can least withstand it.

MORAN WATERSHED

The Moran Lake watershed is 620 acres in size. It drains an area approximately bounded by Soquel Drive on the north, 26th and 30th Avenues on the west, and 45th Avenue on the east. Once termed an intermittent stream, it is clear now that the creek which feeds the lagoon has year round base flow. The lagoon itself resides in a widely used and treasured County Park.

The lagoon at Moran is habitat to numerous species listed in Appendix B of the Santa Cruz County General Plan/Local Coastal Plan (GP/LCP). It is a rare example of a coastal lagoon in an urban area that is managed by the Parks Department. Recently, the County Redevelopment Agency funded the first phase of a Lagoon Restoration Project at this site. This lagoon depends entirely on base flow for its freshwater intake during the summer months. The watershed sits over the Purisima aquifer and does not extend up into the mountains inland.

This critical area is vulnerable to the proposed overpumping of the aquifer in the IWP.

AQUIFER MONITORING

Although the City has recently received a permit for the installation of test wells in the Live Oak area, no mention of how they may be used, and whether they would trigger a respite in groundwater pumping, is made. **Absent clear criteria in the IWP, no assumptions may be made in the EIR that there are any guidelines for use with regard to aquifer level and saltwater intrusion. Coupled with the lack of definition of "drought" conditions, the EIR <u>must</u> assume full scale pumping at all times.** Any such guidelines must be inserted into the IWP and the IWP must be returned to public comment. **I fail to understand how this IWP has failed to include such basic information.**

SUMMARY

The IWP has not provided enough information to proceed with an EIR except to proceed with the worst case assumptions. If the worst case is the actual case, then this is the proper way to proceed. If, however, other assumptions would be more accurate, the IWP should be updated and returned to public review and comment before proceeding to the EIR.

The IWP raises significant issues with regard to the dramatic increase in groundwater pumping of an aquifer that is already pumped beyond capacity. The possible impacts, which include catastrophic collapse of the aquifer, decimation of habitat for critical species, and degradation of community resources, must be properly evaluated if one proceeds with this IWP. I believe that the public would be best served, and public financial resources would be best conserved, by stepping back and addressing the issues raised above prior to proceeding hastily into preparing an EIR.

Yours Sincerely,

Michael Guth

Michael A. Guth

County of Santa Cruz

REC
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BOARD OF SUPERVISORS

701 OCEAN STREET, SUITE 500, SANTA CRUZ, CA 95060-4069

(831) 454-2200 FAX: (831) 454-3262 TDD: (831) 454-2123

SENT VIA FACSIMILE - HARD COPY TO FOLLOW

December 1, 2003

Linette Abbott
Deputy Water Director
City of Santa Cruz
809 Center Street
Santa Cruz, CA 95060

Dear Ms. Abbott:

Please consider the following comments on the proposed EIR on the City of Santa Cruz Integrated Water Program.

1. I am concerned about what increased pumping of the Beltz Wells due to an extensive drought will do to the environment.

2. What would the environmental impact be of such increased pumping to the various watersheds (Arana Gulch, Rodeo Gulch, and Soquel Creek) and lagoons (Schwan, Corcoran, Moran and Capitola) in the area?

3. Is there a threat of salt water intrusion into these lagoons?

Thank you for your attention to this matter.

Sincerely,

Janet Beautz

JANET K. BEAUTZ, Supervisor
First District

JKB:ted

1630A1

WITTWER & PARKIN, LLP
147 SOUTH RIVER STREET, SUITE 221
SANTA CRUZ, CALIFORNIA 95060
TELEPHONE: (831) 429-4055
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Jonathan Wittwer
William P. Parkin
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Andrea M. Kendrick

PARALEGAL
Jana Rinaldi

December 1, 2003

HAND DELIVERED

Linette Abbott
Deputy Director
City of Santa Cruz Water Department
809 Center Street
Santa Cruz, CA 95060

Re: NOP for Integrated Water Plan

Dear Ms. Abbott:

This office represents a group known as "Save the Habitat" and submits the following comments on the Notice of Preparation for the Integrated Water Plan on behalf of our client.

Save the Habitat has worked to prevent further deterioration of creeks, streams and the Purisima Aquifer. Save the Habitat successfully challenged a Negative Declaration for the Soquel Creek Water District's O'Neill Ranch Well which would have dangerously increased overdraft of the Purisima. It is clear that further pumping of the Purisima may lead to saltwater intrusion and further reduction in stream baseflows.

It appears that the Environmental Impact Report for the Integrated Water Plan will be focused on desalination. Save the Habitat is concerned, however, that proposed increased pumping of the Purisima during times of drought will lead to further harm to the Purisima and streams and creeks. For these reasons, Save the Habitat requests that the City include in the Environmental Impact Report for the Integrated Water Plan details and documentation of the City's historical pumping from the Purisima, discussion of overdraft conditions that currently exist, and the impacts that increased pumping will have on the Purisima.

Thank you for your attention and consideration of these comments.

Very truly yours,

WITTWER & PARKIN, LLP

William P. Parkin

The Environmental Committee for the San Lorenzo Valley
A Project of The Valley Women's Club
PO Box 574, Ben Lomond, CA 95005
831/338-1728
Fax: 831/338-7101

November 26, 2003

Linnette Abbott, Deputy Director
Santa Cruz Water Department
809 Center Street, Rm 102
Santa Cruz, CA 95060

Dear Ms. Abbott,

The Valley Women's Club has worked to improve the environment in the San Lorenzo Valley Watershed for twenty-five years. We are, therefore, very concerned about the impact of Santa Cruz City's Integrated Water Plan and have some concerns to share with you.

Like many, we strongly recommend that the potential impacts of increased pumping of the Beltz Wells during drought be considered within the scope of this EIR involving the City's Integrated Water Plan. We disagree with Mr. Kocher's assertion during the public scoping meeting that the Beltz Wells have historically been pumped at the rate intended in this Integrated Water Plan. Omission of the potential impact of increased pumping of the Beltz Wells would be a serious flaw in the EIR process, leaving the City vulnerable to significant legal action. We also expect a thorough analysis of the potential for human growth inducement and the associated environmental impacts of such inducement resulting from the proposed desalination plant. We also expect inclusion of a project alternative involving construction of a larger desalination plant that would require no additional well pumping during drought.

The Valley Women's Club's Environmental Committee urges that the Santa Cruz Integrated Water Plan EIR seek to answer the following questions;

1. The EIR should determine whether the additional water supply obtained from the proposed desalination plant and increased use of the Beltz wells will allow for, and therefore, induce growth of the human population in Santa Cruz County – resulting in increased grading, roads, traffic, impervious surfaces, all of which increase erosion and pollution into the waterways. If there is an increase in population, what will be the impacts to fish and wildlife in the San Lorenzo River Watershed, Soquel Creek Watershed, Live Oak area and the North Coast watersheds used by the Santa Cruz Water Department, from increased water diversion and well pumping during drought and non-drought

years with that increased water demand of a larger human population? Listed species to be considered include steelhead, California red-legged frog and tidewater goby, not to mention many sensitive wildlife species of special concern.

2. The EIR should define and evaluate the environmental impact of increased pumping of the Beltz Wells during extended drought.

3. Also, define and evaluate the environmental impact of potentially reduced surface stream flow due to increased Beltz Well pumping during extended drought to salmonids (primarily steelhead) inhabiting the Arana Gulch, Rodeo Gulch and Soquel Creek watersheds.

4. The EIR should determine the environmental impact of potentially reduced surface stream flow and lowering of the water table due to increased Beltz Well pumping during extended drought to all wetland-dependent wildlife in Schwan Lagoon, Corcoran Lagoon, Moran Lake and Soquel Lagoon, and to wildlife living in stream habitat leading into these lagoons. Species to be considered include the federally listed tidewater goby and the western pond turtle, California species of special concern. We expect a complete biological assessment involving delineation of wetland habitat and the potential impacts to wildlife species inhabiting these areas.

5. The EIR should determine what is the probability of saltwater intrusion and saltwater contamination of the Purisima aquifer resulting from increased pumping of the Beltz wells during extended drought? What would be the environmental impact of the loss of this freshwater supply for domestic use? We expect the EIR preparers to use the MODFLOW computer model to demonstrate that saltwater intrusion will not occur at the proposed pumping rate of the Beltz Wells. We expect the EIR preparers to evaluate when (based on extraction rate and duration) saltwater intrusion would be expected so that a safe margin can be institutionally set in stone. In addition, it should be clearly stated within the model discussion that boundary conditions were set to be representative of anticipated drought conditions. Drought conditions should be defined as anytime water demand exceeds existing supply.

6. The EIR should evaluate whether the increased water supply provided to the Soquel Creek Water District from the proposed desalination plant is found to induce human growth in the mid-county, then what is the probability of saltwater intrusion and saltwater contamination of the Purisima aquifer resulting from increased pumping of Soquel Creek Water District wells (Main Street, etc.) during extended drought when the Soquel Creek Water District will obtain no benefit from the desalination plant? What would be the environmental impact of the loss of this domestic freshwater supply?

7. Please address what would be the environmental impact of a project alternative in which a larger desalination plant is constructed to obviate the increased water extraction from of the Beltz Wells during drought?

8. Finally, please determine what would be the environmental impact of a project alternative in which a larger desalination plant is constructed to provide desalinated water to the Soquel Creek Water District in all years, thus obviating the need for that District to increase well extraction during drought?

Thank you for solicitation of public comment on this very important environmental review of the Santa Cruz City Integrated Water Plan.

Sincerely,

Nancy B. Macy

Nancy B. Macy, Chair

Linette Abbott

From: Donna Paul
Sent: Tuesday, December 02, 2003 7:18 AM
To: Linette Abbott
Subject: FW: City Integrated Water Plan comments

-----Original Message-----
From: bob curry [mailto:curry@ucsc.edu]
Sent: Sunday, November 30, 2003 11:20 AM
To: citywtad@ci.santa-cruz.ca.us
Subject: City Integrated Water Plan comments

Bill Kocher and Board Members: Attn: Linette Abbott, Deputy Director

I've read the full plan, and kept expecting to see an analysis of the Purisima Well Options as an appendix or a separate chapter. It's not there! There no critical analysis or even consideration of groundwater pumping limitations or interactions with other users of that aquifer. There is no discussion anywhere that I could find of safe-yield, regional present demand on the Purisima, potential exchanges between the Purisima and the underlying Santa Margarita sands that also may be tapped, or any basic hydrogeological parameters to determine the feasibility of the proposed increases in use of the Purisima. It is as if doubling withdrawals was provided to the consultants as simply a given fact.

If this is in fact a request for input to a scoping document for an EIR, it seem quite deficient.

I am one of many Santa Cruz County residents who are completely dependant on the Purisima Formation for domestic and agricultural water. I have demonstrated, in the upper Soquel Creek watershed, that enhanced recharge is possible and that the aquifer can be used for sustained yield in the recharge area. But increased use of that aquifer under and near the coastal plain where recharge is now minimal due to development is a completely different story.

I appreciate that the City may have a water right or feel that they do. I also appreciate that it may be possible to request basin adjudication irrespective of surface ownership. I am sure that neither you nor Soquel Creek Water District would favor such adjudication. To avoid that, you need to do a very good analysis of the regional demands and status of water in the Purisima. The City consultants have demonstrated a very limited capacity to understand that Santa Margarita-Purisima system in the past following Ken Muir's USGS Open File Report. This time around, competent work will be required.

I applaud willingness to consider interties and cooperative regional solutions. That part of your work is praiseworthy. Do not taint all of the hard work that has gone into this plan by ignoring this one critical input needed for this part of the total scope of this report.

Robert Curry, PhD
Hydrologist

November 29, 2003

Ms. Linette Abbott
Deputy Director
Santa Cruz Water Dept.
809 Center St., Rm 102
Santa Cruz CA 95060

Dear Ms. Abbott:
I am concerned about the plan to increase the pumping of the Purisima Aquifer by the City of Santa Cruz. I believe we do not fully understand the risks and impact of such a course of action. Other communities along the Central Coast are currently dealing with some of the negative consequences of overdrawing on an aquifer. I would hope we might learn from their mistakes and also take a farsighted approach to solving the problem of insufficient water for the city of Santa Cruz.

It is quite possible that further pumping of the Purisima will lead to a diminishment of the coastal streams, a contamination of the aquifer by seawater intrusion and a negative impact on the wildlife that depends on these resources.

I request that you expand the scope of the EIR to include the effects of increased pumpage of the Purisima Aquifer. As a resident of Soquel, living along Rodeo Creek and 100% dependent on the Purisima Aquifer for our water, I am very concerned about the long range impact of your current plan. I understand there is an alternative project: a desal plant sized for 600 acre-feet/year maximum pumping, even during a drought. Please include a review this in the EIR. Thank you.

Sincerely,
Melisa Walker

Melisa Walker
2370 N. Rodeo Gulch Rd.
Soquel, CA 95073

Comments on the EIR Scoping for Desalination Plant

Submitted by
De Anza Park Home Owner's Association

Contact Person:
Rosemary Breedlove
2395 Delaware, #8
Santa Cruz, Ca 95060
Tel: (831) 458-3077
Email: therbreedlove@yahoo.com

The development of a desalination plant at the three proposed sites (Terrace Point, Antonelli's pond, or the Lipton property) is a questionable proposition. These sites support environmentally sensitive habitats (ESHAs), and the recommended use of Terrace Point by the Santa Cruz Planning Commission is open space, habitat, small scale agriculture and coastal dependent buildings only and very limited in scope.

There are a wide range of issues that preclude development in these areas including wildlife, endangered species, habitat destruction, noise, soil stability, diverted runoff, air quality from construction, growth inducement, and fragmentation of the Santa Cruz Green Belt.

The major questions that should be answered by the EIR are:

How will development at these sites change the water flow in and around the wetlands and the adjacent properties, including Younger Lagoon? There are at least two other wetlands outside the ones on the UCSC property. Terrace Point is the only "clean" watershed for Younger Lagoon.

How will the sites and surrounding area be protected from earthquake damage to the desalinization plant? According to one professional geologist wetlands such as "the pond" on the first coastal terrace are always associated with faults.

If there is damage to the desalination plant what affects would the high saline saturation (brine) have on the plant and animal life?

Have all possible endangered or threatened animal or plant species on or near Terrace point been identified (red-legged frog; burrowing owl; kite; Northern Harrier; peregrine falcon etc.)?

What is the distribution and frequency of residential and transient wildlife in this area? Will the EIR address the wildlife corridor across Terrace Point, including the corridor between Younger Lagoon and Antonelli's Pond? Has a study been done to observe the changes in the wildlife population through the varying seasons?

We are aware that the soils in this area (at least at Terrace Point) are subject to heavy loading of DDT and its breakdown products. How will this be addressed? How will construction activities prevent contamination of Younger Lagoon, Antonelli's Pond, Natural Bridges State Park, and other sensitive habitat areas?

What will be done about the reduced air quality during construction? What will be done to keep debris and dust contained and prevent an impact on area residents and wild life?

What is the effect of incessant noise, from construction, on the wild life and neighbors? Will there be a request for an exception to the city's work ordinance? During the construction of the NOA building the construction noise began before sunrise and lasted well after sundown.

What will be the impact of construction vehicle traffic and road closures for each of the sites? What will be the impact on normal traffic (area residents and commuters)?

What will be done about the odor that permeates the Sunset and West Cliff neighborhood?

Does the plan address the impact of an industrial size plant in an area that is not strictly industrial? Will the plant be brightly lit and noisy? If so what will be done to mitigate the impact and maintain the nightscape and quiet for wildlife and neighbors. What will be done to minimize the visual effect of the plant?

What is the effect of the increased water intake and outflow on marine life? What is the impact of the higher saline water that will be returned to the ocean?

Please continue to preserve the integrity and beauty of our coast.

Rosemary Breedlove,
De Anza Santa Cruz
Mobile Home Owners
Association.

DEC 1 1 2003

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Monterey Bay National Marine Sanctuary
299 Foam Street
Monterey, California 93940

December 5, 2003

Linette Abbott, Deputy Director
City of Santa Cruz Water Department
809 Center St, Room 102
Santa Cruz, California 95060

SUBJECT: Notice of Preparation of an Environmental Impact Report: City of Santa Cruz Integrated Water Plan

Dear Ms. Abbott:

Thank you for the opportunity to provide comments to the City of Santa Cruz on the scope and content of the Santa Cruz Water Department Integrated Water Plan Environmental Impact Report. My staff and I appreciate the diligence that City staff and the Integrated Water Plan Committee have shown towards this project and the consideration given to minimizing impacts to the marine resources of the Monterey Bay National Marine Sanctuary.

The Monterey Bay National Marine Sanctuary (MBNMS) is a Federally protected marine area offshore of California's central coast, encompassing a shoreline length of 276 miles and 5,322 square miles of ocean. The MBNMS was established for the purpose of resource protection, research, education, and public use. Sanctuary management is concerned with desalination because it has the potential to negatively impact the marine environment through the introduction of brine waste effluent and other substances to Sanctuary waters. Depending on the design, it may also lead to entrainment and impingement of marine organisms via the intake systems, and in some cases alteration of the seabed by construction of pipelines for seawater intake and brine disposal.

Several of the Sanctuary's regulations relate directly to desalination. The first involves a prohibition on discharging or depositing any material within Sanctuary boundaries. Since the brine effluent, and in some cases other materials, are usually disposed of in ocean waters, this activity requires Sanctuary authorization of Regional Water Quality Control Board (RWQCB) permits. Another relevant regulation involves a prohibition on activities that cause alteration of the seabed. Thus installation of certain desalination facility structures such as an intake/outfall pipeline on or beneath the ocean floor will also require Sanctuary authorization of California Coastal Commission permits.

The Sanctuary has the following comments regarding the scope and content of the Environmental Impact Report for the desalination related aspects of the Integrated Water Plan:

<u>Entrainment and Impingement:</u> Clearly, one of the major environmental impacts of concern associated with desalination is the impingement and entrainment of organisms resulting from the

seawater intake. Please investigate the feasibility of a sub-seafloor intake structure, and other mitigations such as low velocity intakes, and other engineering and design considerations designed to minimize entrainment and impingement impacts.

Combined Sewage and Brine Effluent: The Sanctuary generally favors the practice of combining desalination brine effluent with other high volume discharges, which results in significant dilution of the brine. However, we recommend evaluation of potential impacts from combining the brine with treated sewage. Some scientists have raised concern over the potential to alter the dilution properties of a treated sewage outfall when combined with desalination brine. Since there is little precedence or research regarding the use of this technique, the EIR should include a thorough analysis on the potential impacts to marine organisms resulting from the combined properties of the discharge, as well as how the addition of brine effluent would affect the dispersal/dilution of the sewage effluent.

Temporal Variation in Operation: Sewage treatment plants do not discharge at a constant rate throughout the day, typically discharging at a much higher volume during daytime hours versus nighttime, while desalination plants tend to operate during the night when power is cheaper. The EIR should address these diurnal fluctuations in operation. When modeling for dilution of the brine plume, it is crucial to include a "worst case scenario" analysis of the dilution properties of the combined sewage effluent and brine plume, during lowest expected flow rates for the treated sewage effluent. Also, in consideration of recent interest by many municipalities towards adoption of wastewater reclamation practices, the EIR should evaluate the potential of the sewage treatment plant to adopt a tertiary treatment system, and how the reduced discharge volumes would affect the properties and dilution of the brine effluent and combined effluent under this scenario.

Growth Inducing Impacts: One of the primary public concerns about desalination is its potential to induce community growth, by introducing a virtually unlimited water supply to communities with limited natural freshwater resources. The Sanctuary is concerned about indirect impacts to marine resources such as increased urban runoff and other threats to water quality which may occur from additional growth. The EIR should include an analysis of the potential growth inducing impacts of the desalination component of the Integrated Water Plan. This should be compared to projected development patterns in relevant planning documents such as Local Coastal Programs, and the County's General Plan.

Other Considerations:

- The EIR should evaluate the potential impacts to recreation, public access, and safety that result from both the construction and operation of the facility. These include potential impacts to SCUBA divers, kayakers, recreational boaters, and commercial and recreational fishermen, as well as an analysis of how it would affect the coastal access at the sites.

- It should also evaluate coastal erosion considerations, and the potential for this project to necessitate new coastal armoring structures to protect related infrastructure including intake and outfall pipelines.

- The EIR should address the cumulative impacts of the plant in conjunction with the current existing and potential desalination facilities in the region, as well as other non-desalination intakes and outfalls in the region.

- The EIR should evaluate the feasibility of using alternative pretreatment techniques such as ozone pretreatment, aimed at reducing the use of chemicals.

Looking beyond the specifics of this particular project, recently the MBNMS has been involved in the issue of desalination as part of the congressionally mandated update of the Sanctuary's Management Plan. The MBNMS has developed a draft action plan for desalination. The goal of this action plan is to devise a regional framework to minimize impacts to Sanctuary resources from desalination activities. We encourage you to review this document, which is attached to this comment letter. Thank you for the opportunity to comment on the Environmental Impact Report for the Integrated Water Plan. If you have any questions on our comments, please contact Brad Damitz of my staff at (831) 647-4252.

Sincerely,

Holly Price

Dr. Holly Price
Resource Protection Coordinator

B RELEVANT GENERAL PLAN GOALS AND POLICIES

B LOCAL REGULATIONS

The City of Santa Cruz, Santa Cruz County, and City of Capitola General Plans / Local Coastal Programs identify goals, policies, and programs that address development within its boundaries. The regulations that are relevant to the proposed Program are identified below by issue area.

B.1 Hydrology and Water Quality

City of Santa Cruz and Local Coastal Program

The goals and policies relevant to the proposed Program from the City of Santa Cruz General Plan Environmental Quality Element are identified below.

Goal EQ 2: Protect the water quality of ocean, watershed lands, surface waters and ground water recharge areas from sedimentation, pollution and salt-water intrusion.

Policy 2.1 – Meet or exceed State Water Resource Control Board standards for discharge of sewage and storm waters to the Monterey Bay.

Policy 2.3 – Ensure that new development or land uses near surface water and groundwater recharge areas do not degrade water quality

Policy 2.3.1 – Design and site development to minimize lot coverage and impervious surfaces, to limit post-development volumes, and to incorporate storm drainage facilities that reduce urban runoff pollutants to the maximum extent possible.

Policy 2.3.1.1 – Where feasible, direct runoff from roof tops and other areas to dry wells.

Policy 2.3.1.2 – Implement policies resulting from AMBAG's Urban Runoff Water Quality Management Study.

Policy 2.3.1.3 – Require low flow velocity, vegetated open channels, area drains incorporating grease and sediment traps, groundwater recharge facilities and detention ponds directly connected to impervious areas.

Policy 2.3.1.4 – Require industrial facilities to comply with the storm water recharge regulations in the National Pollution Discharge Elimination System (NPDES) section of the Federal Clean Water Act.

Policy 2.3.1.5 – Ensure that all parking lots, roads, and other surface drainages that will flow directly into coastal waters have grease, oil, and silt traps.

Policy 2.3.1.8 – Coordinate with the Department of Fish and Game to assure that development that involves alteration of or discharge into wetlands or streams and riparian vegetation is reviewed by the

Department and their recommendations incorporated into the project plans prior to approval of the coastal development permits.

The Safety Element of the City of Santa Cruz General Plan includes the following goals and policies relevant to flooding in the study area. (Note, these policies are only relevant to the Shaffer Road/Antonnelli's Pond Area)

Goal S 3: Minimize risks to residents as a result of flood hazards

Policy 3.1.1 – Restrict or prohibit uses in undeveloped flood areas and maintain flood plain and floodway regulations in developed flood areas.

Policy 3.1.2 – Minimize the alteration of natural flood plains, stream channels and natural protective barriers that accommodate or channel floodwaters.

Policy 3.1.3 – Control filling, grading, dredging and other development that may increase flood potential.

City of Santa Cruz and Local Coastal Program (Moore Creek Corridor Access and Management Plan Policies and Programs)

The Moore Creek Corridor Management and Access Plan includes the following policies relevant to protect area hydrology and water quality.

Policy 1.3 – Maintain the water quality of Moore Creek at the highest level feasible by regulating the discharge of storm waters into Moore Creek and its tributaries.

Policy 1.3.1 – Maintain all post-project runoff at pre-project levels through the use of retention or detention ponds, with a controlled release, to trap sediment and sediment bound heavy metals, nitrates and phosphates.

Policy 1.4 – Significantly reduce the quantity of sediments transported to Moore Creek and Antonelli Pond.

Policy 1.4.1 – Require the submission and installation of erosion control and grading plans for all projects located in the Moore Creek Watershed Area.

Policy 1.4.2 – Require that all exposed slopes shall be revegetated immediately upon cessation of grading activities through installation of permanent vegetation in conjunction with hydroseeding and other temporary erosion control measures. Temporary berms shall be in place at the edge of the setback line to prevent siltation of Moore Creek. These temporary berms shall be replaced by permanent measures prior to project clearance and/or subdivision acceptance.

Policy 1.4.3 – Limit vegetation removal to that amount necessary to complete approved construction projects. Any vegetation removed shall be replaced or replanted so as to ensure slope stability, limit soil erosion potential and significant reduce off-site sedimentation.

Policy 1.4.4 – Require that land be developed in increments of workable size which can be completed in a single construction season. Erosion and sediment control measures shall be coordinated with a sequence of grading, development, and construction operations. Erosion control measures shall be put into effect prior to the commencement of the next inclement period.

Policy 1.4.5 – Prohibit all earth-moving activities between December 1st and March 1st. In addition, grading activities shall not begin after September 1st unless grading can be expected to be completed and plantings completed by December 1st.

Policy 1.4.6 – Prohibit grading, vegetation removal, construction of structures or alteration of the existing contours within twenty feet of any 30% slope. Precise topographic survey shall be conducted as part of the project review to ensure that erodible soil conditions beyond the 20-foot setback are not disturbed.

Policy 1.4.7 – Designate specific building envelopes on all plans submitted for permit processing within the Moore Creek Corridor study area. NO construction shall occur outside of the designated building envelope.

Santa Cruz County and Local Coastal Program

The Conservation and Open Space Element includes the following policies relevant to study area hydrology and water quality.

Policy 5.7.1 – Prohibit new development adjacent to marshes, streams, and bodies of water if such development would cause adverse impacts on water quality which cannot be fully mitigated.

Policy 5.7.3 - For all new and existing development and land disturbances, require the installation and maintenance of sediment basins, and/or other strict erosion control measures, as needed to prevent siltation of streams and coastal lagoons.

Policy 5.7.4 – New development shall minimize the discharge of pollutants into surface water drainage by providing the following improvements or similar methods which provide equal or greater runoff control.

> b) oil, grease and silt traps for parking lots, land divisions or commercial and industrial development.

Policy 5.7.5 - Require drainage facilities, including curbs and gutters in urban areas, as needed to protect water quality for all new development within 1000 feet of riparian corridors or coastal lagoons.

Policy 5.7.7 - …obtain appropriate stormwater discharge permits for all existing storm drainage systems and proposed drainage facilities and adhere to best management practices.

Policy 5.8.5 - Allow development of groundwater resources when consistent with sustainable yield, protection of streamflows, and maintenance of groundwater quality.

The Public Safety and Noise Element of the Santa Cruz County General Plan includes the following policies relevant flood hazards in the study area. (Note, these policies are only relevant to the Shaffer Road/Antonnelli's Pond Area)

Policy 6.4.1 – Require a geologic hazards assessment of all proposals within the County's flood hazard areas in order to identify flood hazards and development constraints

Policy 6.4.4 – Require new utilities, and critical facilities … to be located outside the 100-year flood and coastal high hazard areas, unless such facilities are necessary to serve existing uses, there is no other feasible location, and construction of these facilities will not increase hazards to life or property within or adjacent to the floodplain….

Policy 6.4.7 – Restrict new construction to the area outside the 100-year floodplain…., if a buildable portion of the parcel exists outside such areas.

The Parks, Recreation and Public Facilities Element includes the following policy relevant to study area hydrology, water supply and water quality.

Policy 7.18.5 – Promote water management in the Pajaro Valley and Santa Margarita groundwater basins and the Soquel-Aptos area to protect the long-term security of water supplies and to safeguard quality and maintain stream baseflows.

City of Capitola General Plan and Local Coastal Program

While Policy 14 of the Local Coastal Program indicates that erosion and runoff regulations shall be enacted, other policies relevant to the construction of conveyance facilities were not found upon review of the document.

B.2 Marine Resources

City of Santa Cruz and Local Coastal Program

Goal EQ 2: Protect and enhance natural vegetation communities and wildlife habitats throughout the City.

Policy 4.1 – Protect the natural ecosystem of the Monterey Bay Marine Sanctuary and the shoreline.

Policy 4.1.1 – Cooperate with appropriate agencies to protect and manage offshore kelp beds

Santa Cruz County and Local Coastal Program

Objective 5.3 – Aquatic and Marine Habitats – To identify, preserve and restore aquatic and marine habitats; to maximize scientific research and education which emphasizes comprehensive and coordinated management consistent with the mission of the Monterey Bay National Marine Sanctuary; and to facilitate multiple use and recreation opportunities compatible with resource protection.

Policy 5.3.2 – Protecting Shorebird Nesting Sites – Discourage all activities within 100 feet of shorebird nesting sites during nesting season (March-July). Prohibit dogs from beaches having nesting sites.

City of Capitola

Goal: Protect and preserve the natural resources within the Capitola area.

B.3 Land Use, Planning, and Recreation

City of Santa Cruz and Local Coastal Program

The Land Use Element of the City of Santa Cruz General Plan and Local Coastal Program includes the following policies relevant to land use, planning, and recreation (Note, these policies are only relevant to the Terrace Point Area and the Shaffer Road/Antonnelli's Pond Area).

Policy L 2.2.4: Require a specific plan for the 60-acre Terrace Point property before development occurs. The following gives directions to the specific plan:

- Reserve approximately 25 acres for coastal-dependent uses and coastal-related uses, use intensities should not exceed 20 employees/acre for development related to unique opportunities related to the Monterey Bay Marine Sanctuary.
- Reserve 6.5 acres along the coast for coastal recreation uses.
- The specific plan shall include at least 15 acres for housing and housing-supporting uses. Housing shall be predominately of the multiple resident type, clustered for efficient use of the land, and 35% should be affordable to very-low and low-income households. The specific plan shall address housing of greatest need in the community: affordable units, rental units, small units. The concept is a neighborhood which, while not self-contained, includes services, facilities and connections to nearby employment centers, in order to create a more pedestrian-oriented community.
- Provide parks and open space for the resident and employee population according to the standards of the Parks and Recreation Element. The planning process shall take into account potential unmet parks and open space needs of the City, especially for community park facilities, playing fields and agricultural uses.
- The specific plan shall take into account policies of the General Plan. The circulation system shall be developed in light of the overall City objective of limiting automobile trips. Environmental resources such as Antonelli's Pond, Younger Lagoon, Natural Bridges Park, Moore Creek, the ocean, and agricultural land shall be buffered and/or protected. Community design objectives shall be addressed by taking into account the various viewsheds including from Highway 1, views to and along the ocean, views internal to the project; by relating development in appropriate ways to De Anza Mobile Home Park and Long Marine Lab. Urban limit policies shall be addressed by sizing utilities to serve the specific plan area and Long Marine Lab and not include additional

capacity of future development of agricultural lands beyond the city limits. Concurrency policies shall be addressed by providing facilities and services for which a demand is created by the development of the parcel. Mitigation measures shall be developed to diminish the impact on public facilities and services. Phasing of development may be considered as one way to mitigate the impact of development.

Policy L 2.2.5: Require a specific plan for the 11-acre Swenson [Shaffer Road / Antonelli's Pond Area] parcel (designated in low density residential) adjoining Antonelli Pond in the Westside Lands area.

- Housing shall be clustered within six total acres, five acres shall be in open space uses such as organic agriculture or community garden, play areas (possibly playing fields), and development setbacks and open space buffers along Antonelli pond.

- The upper limit for the number of units is 80; the number of units may be increased if the affordable percentage is increased accordingly.

- Adequate setbacks from Antonelli Pond, a drainage plan, landscaping plan including native drought-resistant vegetation, and appropriate restrictions on domestic pet ownership shall be required.

- Public access to Antonelli Pond shall be preserved.

- Development must be consistent with the *Moore Creek Access and Management Plan*.

- Planning for residential units shall be guided by the integrated concepts of cohousing and/or clustered housing. Neighborhood services may include day care, community gardens, convenience goods and services.

- The circulation system should include transit, bike and pedestrian ways. Development of the residential component shall be contingent on the enforceable reduced use of private automobiles and/or establishment of rail transit and/or housing formally tied to employment within close proximity to the site.

- Acquire right-of-way over the rail tracks at Shaffer Road and require that primary egress be directed to Mission Street rather than Delaware Avenue.

- The project should strive to achieve the highest percentage of affordable housing to low- and very-low-income households.

City of Santa Cruz and Local Coastal Program (Moore Creek Corridor Access and Management Plan Policies and Programs)

The Moore Creek Corridor Management and Access Plan includes the following policies relevant to land use and planning.

Policy 3.1: Should any development of the existing City open-space lands west of Moore Creek be considered, a specific area plan designed to implement the goals of the Moore Creek Corridor Access and Management Plan shall first be developed to: determine appropriate land uses and circulation patterns; designate setbacks from canyon edges, designate sufficient land forms and existing vegetation for preservation; designate pedestrian pathways to and from canyon edge, and Moore Creek; determine appropriate lands for fee simple or easement acquisition.

Policy 3.5: Future Development of lands adjacent to Antonelli Pond within Westside Lands Study Area shall incorporate relevant policies and programs of the Moore Creek Corridor Access and Management Plan.

City of Capitola

The Land Use Element of the City of Capitola General Plan includes the following goal and policy relevant to land use, planning, and recreation.

Goal: Ensure that all new construction or reconstruction is compatible with existing uses.

Policy 1: Control scale and bulk structures through appropriate controls in the Zoning Ordinance.

B.4 Biological Resources

City of Santa Cruz and Local Coastal Program

Goal EQ 2: Protect and enhance natural vegetation communities and wildlife habitats throughout the City.

Policy 4.1 – Protect the natural ecosystem of the Monterey Bay Marine Sanctuary and the shoreline.

Policy 4.1.1 – Cooperate with appropriate agencies to protect and manage offshore kelp beds.

Policy 4.1.2 – Preserve the habitat of and minimize disturbance to seabird rookeries and roosting areas along the coastline.

Policy 4.1.5 – Protect the quality of water discharged into the Bay and allow no dumping of materials into the Monterey Bay.

Policy 4.2 – Preserve and enhance the character and quality of riparian and wetland habitats, as identified on Maps EQ-8 and EQ-11 [in the City of Santa Cruz General Plan], or as identified through the planning process or as designated through the environmental review process.

Policy 4.2.2 – Minimize the impact of development upon riparian and wetland areas through setback requirements of at least 100 feet from the center of a watercourse for riparian areas and 100 feet from a wetland. Include all riparian vegetation within the setback requirements, even if it extends more than 100 feet from the water course or if there is no defined water course present.

Policy 4.2.2.3 – Prohibit uses such as construction of main or accessory structures, grading or removal of vegetation within riparian and wetland resource and buffer areas and allow permitted uses (such as previous non-motor vehicular trails, incidental public services, maintenance and replacement of existing Public Works facilities, maintenance of existing or restoration of previously dredged depths in flood control projects and navigational channels, small-scale facilities (500 sq. ft. or less) associated with nature study or resource-dependent activities, construction, grading or removal of vegetation necessary for maintenance, landscaping designed to provide a natural buffer and grading necessary as a part of such landscaping plan, passive recreation, habitat preservation and restoration) that are consistent with the environmental quality policies of the Plan, Section 30222 of the Coastal Act, and adopted management plans. Development in wetlands can be undertaken only where there is no feasible, less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects. If any exceptions to this policy are to be considered, it shall be within the context of a resource management plan which plan shall be approved by the Coastal Commission as an amendment to the Land Use Plan.

Policy 4.2.3 – Minimize increased runoff into riparian and wetland areas unless biological evaluation recommends increased inflows.

Policy 4.2.4 – Preserve riparian and wetland vegetation by minimizing removal and allowing only for uses dependent on the resources, passive recreational use, and maintenance of existing uses according to adopted management plans with compensating mitigation.

- Remove non-native invasive plants as specified in the management plans.

Policy 4.2.5 – Protect and minimize the impact of development on bird, fish and wildlife habitat in and adjacent to waterways.

Policy 4.3 – Preserve the character and quality of grassland habitats, as identified on Map EQ-8 [in the City of Santa Cruz General Plan] by minimizing disturbance and removal of native grasslands and design landscaping to provide a natural buffer.

Policy 4.4 – Preserve the character and quality of brush, mixed evergreen forest, Monterey pine, redwood forest and eucalyptus habitats, as identified on Map EQ-8 [in the City of Santa Cruz General Plan] by minimizing removal of trees and brush where they are an integral part of the community or habitat and requiring introduced landscaping to be compatible with the established tree and/or brush community.

Policy 4.5 – Continue the protection of rare, endangered, sensitive and limited species and the habitats supporting them as shown in Map EQ-9 [in the City of Santa Cruz General Plan] or as identified through the planning process or as designated as part of the environmental review process.

> **Policy 4.5.1** – Maintain an up-to-date list and map of sensitive, rare and endangered flora and fauna to ensure their protection in the environmental review process.
>
> **Policy 4.5.3** – Protect monarch butterfly overwintering sites and ensure adequate buffering of these sites from development.
>
> **Policy 4.5.4** – Preserve Black Swift and Pigeon Guillemot habitat by monitoring the effects of erosion repair work along West Cliff Drive and timing construction in areas near these habitats to avoid disturbing them during the nesting season ensuring that no significant adverse impact occurs.

Policy 4.6 – Encourage the planting and restoration of native rather than non-native vegetation throughout the City and also in areas where plants or habitats are diseased or degraded.

Policy 4.7 – Minimize the impact of grading and filling on plant and animal life.

City of Santa Cruz and Local Coastal Program (Moore Creek Corridor Access and Management Plan Policies and Programs)

The Moore Creek Corridor Management and Access Plan includes the following policies relevant to protect biological resources.

Policy 1.1 – The existing vegetation along the Moore Creek Corridor shall be retained and protected to the maximum extent feasible.

> **Policy 1.1.1** – Require that replanting and/or plant removal be designed to increase quantity, diversity and productivity of native vegetation to ensure slope protection, habitat enhancement and buffering.
>
> **Policy 1.1.2** – Removal of non-native vegetation should be considered only in those areas where this action will serve to protect concentrations of native vegetation…

Policy 1.3 – Maintain the water quality of Moore Creek at the highest level feasible by regulating the discharge of storm waters into Moore Creek and its tributaries.

> **Policy 1.3.1** – Maintain all post-project runoff at pre-project levels through the use of retention or detention ponds, with a controlled release, to trap sediment and sediment bound heavy metals, nitrates and phosphates.

Policy 1.4 – Significantly reduce the quantity of sediments transported to Moore Creek and Antonelli Pond.

Policy 1.4.1 – Require the submission and installation of erosion control and grading plans for all projects located in the Moore Creek Watershed Area.

Policy 1.4.2 – Require that all exposed slopes shall be revegetated immediately upon cessation of grading activities through installation of permanent vegetation in conjunction with hydroseeding and other temporary erosion control measures. Temporary berms shall be in place at the edge of the setback line to prevent siltation of Moore Creek. These temporary berms shall be replaced by permanent measures prior to project clearance and/or subdivision acceptance.

Policy 1.4.3 – Limit vegetation removal to that amount necessary to complete approved construction projects. Any vegetation removed shall be replaced or replanted so as to ensure slope stability, limit soil erosion potential and significant reduce off-site sedimentation.

Policy 1.4.4 – Require that land be developed in increments of workable size which can be completed in a single construction season. Erosion and sediment control measures shall be coordinated with a sequence of grading, development, and construction operations. Erosion control measures shall be put into effect prior to the commencement of the next inclement period.

Policy 1.4.5 – Prohibit all earth-moving activities between December 1st and March 1st. In addition, grading activities shall not begin after September 1st unless grading can be expected to be completed and plantings completed by December 1st.

Policy 1.4.6 – Prohibit grading, vegetation removal, construction of structures or alteration of the existing contours within twenty feet of any 30% slope. Precise topographic survey shall be conducted as part of the project review to ensure that erodible soil conditions beyond the 20-foot setback are not disturbed.

Policy 1.4.7 – Designate specific building envelopes on all plans submitted for permit processing within the Moore Creek Corridor study area. NO construction shall occur outside of the designated building envelope.

Santa Cruz County and Local Coastal Program

Policy 5.1.6: Development within Sensitive Habitats: Sensitive Habitats shall be protected against any significant disruption of habitat values; and any proposed development within or adjacent to these areas must maintain or enhance the functional capacity of the habitat. Reduce in scale, redesign, or, if no other alternative exists, deny any project which cannot sufficiently mitigate significant adverse impacts on sensitive habitats unless approval of a project is legally necessary to allow a reasonable use of the land.

Policy 5.1.8 Chemicals Within Sensitive Habitats. Prohibit the use of insecticides, herbicides or any toxic chemical substance in sensitive habitats, except when an emergency has been declared, when the habitat itself is threatened, when a substantial risk to public health and safety exists, including maintenance for flood control by Public Works, or when such use is authorized pursuant to a permit issued by the Agricultural Commissioner.

Policy 5.1.10 Species Protection – Recognize that habitat protection is only one aspect of maintaining biodiversity and that certain wildlife species, such as migratory birds, may not utilize specific habitats. Require protection of these individual rare, endangered and threatened species and continue to update policies as new information becomes available.

Policy 5.1.11 Wildlife Resources Beyond Sensitive Habitats – For areas which may not meet the definition of sensitive habitat contained in policy 5.1.2 [of the Santa Cruz County General Plan], yet contain valuable wildlife resources (such as migration corridors or exceptional species diversity), protect these wildlife habitat values and species using techniques outlined in policies 5.15 and 5.1.7 [of the Santa Cruz County General Plan] and use other mitigation measures identified through the environmental review process.

Objective 5.2 Riparian Corridors and Wetlands – To preserve, protect and restore all riparian corridors and wetlands for the protection of wildlife and aquatic habitat, water quality, erosion control, open space, aesthetic and recreational values and the conveyance and storage of flood waters.

Policy 5.2.3 Activities Within Riparian Corridors and Wetlands – Development activities, land alteration and vegetation disturbance within riparian corridors and wetlands and required buffers shall be prohibited unless an exception is granted per the Riparian Corridor and Wetlands Protection ordinance. As a condition of riparian exception, require evidence of approval for development from the US Army Corps of Engineers, California Department of Fish and Game, and other federal or state agencies that may have regulatory authority over activities within riparian corridors and wetlands.

Policy 5.2.4 Riparian Corridor Buffer Setback – Require a buffer setback from riparian corridors in addition to the specified distances found in the definition of riparian corridor. This setback shall be identified in the Riparian Corridor and Wetland Protection ordinance and established based on stream characteristics, vegetation and slope. Allow reductions to the buffer setback only upon approval of a riparian exception. Require a 10 foot separation from the edge of the riparian corridor buffer to any structure.

Policy 5.2.7 Compatible Uses with Riparian Corridors – Allow compatible uses in and adjacent to riparian corridors that do not impair or degrade the riparian plant and animal system, or water supply values, such as non-motorized recreation and pedestrian trails, parks, interpretive facilities and fishing facilities. Allow development in these areas only in conjunction with approval of a riparian exception.

City of Capitola

Goal: Protect and preserve the natural resources within the Capitola area.

Policy 10 – It shall be the policy of the City to protect, maintain and, where possible, enhance the environmentally sensitive and locally unique habitats within its coastal zone, including dedication and/or acquisition of scenic conservation easements for protection of the natural environment. All developments approved by the City within or adjacent ot these areas must be found to be protective of the long-term maintenances of these habitat.

Policy 11 – It shall be the policy of the City to maintain the maximum amount of native vegetation along Soquel Creek and other riparian areas, and to strongly support the California Department of Fish and Game in requiring a minimum flow that will support a healthy riparian habitat and permanent fishing resource in Soquel Creek.

Policy 16 – The City shall maintain and, as feasible, continue to enhance the habitat values of Soquel Creek through the use of the Automatic Review Zone for the Soquel Creek Riparian Corridor and Lagoon. When considering or granting a permit in this area, the City shall give special consideration to the environmental sensitivity of this area including dedication of scenic conservation easements. In addition, the City shall encourage the use of appropriate native local riparian vegetation.

Policy 18 – It shall be the policy of the City to protect the winter resting sites of the Monarch Butterfly in the eucalyptus groves of Escalona Gulch and Soquel Creek as designated on Map VI-2 [of the City of Capitola General Plan] by requiring detailed analysis of the impacts of development on the habitat.

B.5 Noise

City of Santa Cruz and Local Coastal Program

The goals and policies relevant to the proposed Program from the City of Santa Cruz General Plan Environmental Quality Element are identified below.

Goal EQ 6: Maintain an environment that is not degraded by excessive urban noise by establishing compatibility standards for land uses and noise levels, protecting new land use from the impacts of excessive traffic noise and mitigating the impacts of road projects.

Policy 6.1 – Require land uses to operate at noise levels that do not significant increase surrounding background (ambient) noise levels.

> **Policy 6.1.1** – Use site planning and design approaches to minimize noise impacts from new development on surrounding land uses.
>
> **Policy 6.1.2** – Ensure that construction activities are managed to minimize overall noise impacts.

Santa Cruz County and Local Coastal Program

Objective 6.9a. Noise Environment: To promote land uses that are compatible with each other and with the existing and future noise environment. Prevent new noise sources from increasing the existing noise levels above acceptable standards and eliminate or reduce noise from existing objectionable noise sources.

> **Policy 6.9.1 –** Land Use Compatibility Guidelines – Require new development to conform with the Land Use Compatibility Guidelines (Figure 6-1 [in the Santa Cruz County General Plan]). All new residential and noise sensitive land developments should conform to a noise exposure standard of 60 dB Ldn (day/night average noise level) for outdoor noise and 45 dB Ldn for indoor noise. New development of land which cannot be made to conform to this standard shall not be permitted. Assure a compatible noise environment for various land uses through site planning, building orientation and design, interior layout, and physical barriers, landscaping, and buffer areas where appropriate.
>
> **Policy 6..9.2** – Acoustical Studies – Require acoustical studies for all new residential development with a future Ldn noise exposures greater than 60 dB…Require acoustical studies for all new projects which may affect the existing noise level and may not conform to the Land Use Compatibility Guidelines in Figure 6-1 [of the Santa Cruz County General Plan].
>
> **Policy 6..9.7** – Construction Noise: Require mitigation of construction noise as a condition of future project approvals.

City of Capitola

Goal: Ensure that land uses and the noise environment are compatible.

Policy 9: Require sound reduction measures where indicated as necessary to maintain compatibility of land uses.

B.6 Air Quality

City of Santa Cruz and Local Coastal Program

Santa Cruz supports the efforts of the Monterey Bay Unified Air Pollution Control District (MBUAPCD) through eight policies

- population growth control strategies;
- land use location criteria;
- supporting efforts for MBUAPCD ambient air quality monitoring system;
- support of MBUAPCD AQMP strategies;
- vegetation enhancement and maintenance strategies;
- development and implementation of transportation control management measures
- support of State and federal carbon dioxide and ozone depleting substance reduction laws/regulations; and
- development of a smoking ordinance.

Santa Cruz County and Local Coastal Program

The County supports the efforts of the MBUAPCD through 10 policies, as follows.

- review of new land developments;
- restrictions on stationary sources that emit 25 tons of pollutants or more;
- mitigation requirements;
- restrictions on oil development on and off shore;
- land use location criteria;
- transit and non-automotive transportation enhancement measures;
- vegetation enhancement and maintenance strategies;
- development and implementation of transportation control management measures; and
- support of State and federal carbon dioxide and ozone depleting substance reduction laws/regulations.

B.7 Geology and Soils

City of Santa Cruz and Local Coastal Program

The Conservation and Open Space Environmental Quality Element includes the following policies relevant to study area Geology and Soil.

Policy 3.1 – Require site design and erosion control measures in areas subject to erosion hazards or adjacent to streams and wetlands areas to minimize grading activities and vegetation removal.

> **Policy 3.1.2** - Prohibit grading during wet winter months and ensure that any grading or stockpiles are revegetated or covered before winter months
>
> **Policy 3.1.3** - Require an erosion control plan for all new projects located within or adjacent to erosion hazard areas and for all development proposals involving slopes exceeding 10%.
>
> **Policy 3.1.5** - Evaluate new development adjacent to the Moore Creek corridor for adequacy of erosion control measures.
>
> **Policy 3.2.3** - Generally require at least a 20-foot setback from slopes over 30%; in no case shall the setback be less than 10 feet from the top edge of the slope.
>
> **Policy 3.2.4** - Prohibit land divisions that could degrade distinctive natural features….

Policy 3.3 - Protect ocean cliffs and cliff edges from human activity that creates erosion and cliff retreat.

The Safety Element contains the following goals and policies regarding study area seismicity.

Goal S 1: Minimize hazards to people and property resulting from seismic activity

Policy 2.1 – Require site specific geologic investigations by qualified professionals for… industrial development in known potential liquefaction and other seismic hazard areas and require the developments to incorporate the mitigations recommended by the investigations.

Policy 2.2 - Adopt new State-approved Uniform Building Codes (UBC) and require that all new construction conform with the latest edition of the UCB.

Santa Cruz County and Local Coastal Program

The Public Safety and Noise element includes policies relevant to soil erosion control in the study area.

> **Policy 6.3.3** – Require, as a condition of development approval, abatement of any grading or drainage condition on the property which gives rise to existing or potential erosion problems.
>
> **Policy 6.3.4** – Require approval of an erosion control plan for all development, as specified in the Erosion Control ordinance. Vegetation removal shall be minimized and limited to that amount indicated on the approved development plans, but shall be consistent with fire safety requirements.
>
> **Policy 6.3.5** – Require the installation of erosion control measures consistent with the Erosion Control ordinance, by October 15, or the advent of significant rain or project completion, whichever occurs first. For development activities, require protection of exposed soil from erosion between October 15 and April 15 and require vegetation and stabilization of disturbed areas prior to completion of the project.
>
> **Policy 6.3.7** - Require that topsoil be stockpiled and reapplied upon completion of grading to promote regrowth of vegetation; native vegetation should be used for replanting disturbed areas to enhance long term stability.
>
> **Policy 6.3.8** – Require containment of all sediment on the site during construction and require drainage improvements for the completed development that will provide runoff control, including on-site retention or detention where downstream drainage facilities have limited capacity. Runoff control systems or best management practices shall be adequate to prevent any significant increase in site runoff over pre-existing volumes and velocities and to maximize on-site collection of non-point source pollutants.
>
> **Policy 6.3.9** - Require site design in all areas to minimize grading activities and reduce vegetation removal based on the following guidelines:
>
> > a) structures should be clustered…
> >
> > e) Require all fill and sidecast material to be recompacted to engineered standards, reseeded, and mulched and/burlap covered.
>
> **Policy 6.3.10** – Require a land clearing permit and an erosion control plan for clearing one or more acres….
>
> **Policy 6.4.7** – Restrict new construction to the area outside the 100-year floodplain…., if a buildable portion of the parcel exists outside such areas.

B.8 Cultural Resources

City of Santa Cruz and Local Coastal Program

Goal CR1: Ensure the protection and proper disposition of archaeological and paleontological sites to preserve resources important to the community's heritage.

Goal CR2: Designate, protect and enhance those structures and landmarks contributing to the cultural, historic, and architectural character of Santa Cruz.

Goal CR3: Maintain adequate local museums and exhibition facilities.

Santa Cruz County and Local Coastal Program

- Protection of archaeological resources prior to evaluation and the maintenance of a Native American Cultural Sites Ordinance
- The requirement of an archaeological survey in sensitive areas an element in project applications.
- Protection of archaeological resources from development by restricting grading and other ground-disturbing activities, when feasible, in study areas away from known resources
- The requirement that developments proposed on a documented archaeological resource be reviewed by a professional archaeologist.
- A prohibition on disturbance of any Native American site without a preservation and mitigation plan

City of Capitola

Policy 24: Provide for the protection, preservation and proper disposition of archaeological, historical and paleontological resources.

Policy 26: Identify architecturally and histor8ically significant structures and provide for their protection.

B.9 Public Services and Utilities

City of Santa Cruz and Local Coastal Program

The Land Use Element of the City of Santa Cruz General Plan and Local Coastal Program includes the following goal relevant to public services and utilities.

Goal L 4: Plan community facilities and services to serve the projected population, allowing development only when adequate facilities and services are provided and are available to serve it.

Santa Cruz County and Local Coastal Program

The Parks, Recreation and Public Facilities Element of the Santa Cruz County General Plan and Local Coastal Program includes the following policy relevant to public services and utilities.

> **Policy 7.26.3:** Recreational Use of Utility Rights-of-Way: Encourage the use of utility rights-of-way for bikeways and hiking paths where appropriately located and where shown to be not hazardous to users.

City of Capitola

The Parks and Conservation Element of the City of Capitola General Plan includes the following policies relevant to public services and utilities.

> **Policy 1:** The City will work with the Santa Cruz County Sanitation District to develop a priority list and timeline for storm water drainage improvements for all neighborhoods in the City.
>
> **Policy 3:** Undergrounding of all utilities within the City is a long range goal. The City shall develop a priority list and estimated time line for the undergrounding of utilities for all neighborhoods within the City. Further, the City shall encourage the formation of assessment districts to finance utility undergrounding.

B.10 Aesthetics / Visual Resources

City of Santa Cruz and Local Coastal Program

<u>Community Design Element</u>

Goal CD 2: Protect and enhance the City's natural setting and scenic resources.

Goal CD 3: Maintain and enhance the City's unique built character and emphasize a human/pedestrian scale to development.

Goal CD 5: Improve the visual quality of the City's major roadways and entrances to enhance an area's sense of place and provide noticeable paths and entrances throughout the City.

Policies:

1.4 Where development abuts open space lands, utilize careful site planning to emphasize natural edges provided by topography and vegetation and maintain visual and physical access to open space areas.

2.1 Preserve natural features providing visual definition to an area within the City.

2.2 Preserve important public views and viewsheds by ensuring that the scale, bulk and setback of new development does not impede or disrupt them.

3.4 Develop and maintain physical and visual linkages between key areas in the City: The Shoreline and adjacent land uses.

4.7 When sounds walls are used, ensure that they are visually interesting and well landscaped.

Santa Cruz County and Local Coastal Program

<u>Open Space Element</u>

Objectives:

Objective 5.10a: To identify, protect and restore the aesthetic values of visual resources.

Objective 5.10b: To ensure that new development is appropriately designed and constructed to have minimal to no adverse impact upon identified visual resources.

Policies:

5.10.1: Designation of Visual Resources
5.10.2: Development within Visual Resource Areas
5.10.3: Protection of Public Vistas
5.10.4: Preserving Natural Buffers
5.10.5: Preserving Agricultural Vistas
5.10.6: Preserving Ocean Vistas
5.10.7: Open Beaches and Blufftops
5.10.8: Significant Tree Removal Ordinance
5.10.9: Restoration of Scenic Areas
5.10.10: Designation of Scenic Roads (several roadways)
5.10.11: Development Visible from Rural Scenic Roads
5.10.12: Development Visible from Urban Scenic Roads
5.10.15: Design Review for Public Projects Visible from Scenic Roads
5.10.24: Utility Service Lines

<u>Community Design Element</u>

Goal: To preserve and enhance the quality of life in Santa Cruz through the guidance of development activity to protect open space for its aesthetic, recreational and environmental values …

Objectives:

Objective 8.1: *Quality Design*. To achieve functional high quality development through design review policies which recognize the diverse characteristics of the area, maintains design creativity, and preserves and enhances the visual fabric of the community.

Objective 8.3: *Development Clustering*.

Objective 8.6: *Building Design*.

Policies:

8.1.2: Design Review Ordinance
8.2.2: Designing for Environmental Protection
8.2.3: Design Criteria for Utilities
8.3.1: Clustering for Environmental Protection
8.6.3: Story Limitation
8.6.5: Designing with the Environment
8.6.6: Protecting Ridgetops and Natural Landforms

City of Capitola

<u>Land Use Element</u>

Goal: Maintain Capitola's existing small town scale, character and flavor.

Goal: Ensure that all new construction or reconstruction is compatible with existing uses.

***Policy 1*:** Control scale and bulk of structures through appropriate controls in the Zoning Ordinance.

Open Space Element

Goal (5): to conserve and enhance the waterfront area for public use and views
Policy 1: The following significant natural features are of ecological, visual and safe well being to the community and should be included in the Open Space system in essentially their natural state:

- The waterfront area except for modifications needed for cliff stabilization, beach maintenance, and wharf improvements,
- The coastal bluffs with modifications needed for stabilization and public safety.

Conservation Element

Goal: Protect and preserve the natural resources within the Capitola area.
Policy 3: Undergrounding of all utilities within the City is a long range goal.

Local Coastal Program Policies

Land Use/Visual (Capitola Village Area)

Policy 9: It shall be the policy of the City of Capitola to maintain the natural features, visual resources, and unique character of the Capitola Village. This includes maintenance of the particular scale and character of Capitola Village, retaining its special ability to sever both Capitola residents and visitors, protecting its natural features and views, and recognizing its historical continuity extending from the Camp Capitola period through the present. A commitment shall be made to maintaining the level of current activity in the Central Village area and/or intensifying activity and increasing capacity only in ways consistent with the current scale and character of Capitola Village.

Implementation: (a) Develop project review criteria to preserve trees and other vegetation along Cliff Avenue and Prospect Avenue, along Soquel Creek and within the Village.
(b) Develop a special zoning district for the Village. The district shall include design review requirements to protect the unique Village character.

Policy 10: It should be recognized that the historical continuity of development in Capitola Village is an evolutionary process that doesn't stop in the present. New styles of architecture may be as appropriate now as they have proved to be in the past. Capitola will continue to evolve as it has before, but should maintain a consistency of scale and a variety of architectural types to support the goal to preserve the special scale and character of historical Capitola Village.

Implementation: Develop design review guidelines and a development review process for new construction and rehabilitation to ensure that building materials including siding, roofing, doors and windows are appropriate for the building design and the new Village character.

Policy 11: To ensure the maintenance of the special scale and character of Capitola Village, development proposals within the Village area shall be subject to Architectural and Site and Planning Commission Review with emphasis placed on the following design particulars:

(a) Building bulk, width, height and roofscape
(b) Architectural thematic units including:
- Window size and scale and frame materials
- Color variety
- Material variety
- Signage

- Scale of articulation

(c) Street thematic units including:
- Trees, ground cover and foliage
- Street, path and public space lighting
- Paving patterns and paving materials
- Traffic and parking furniture
- Signage

(d) A continuing program for the removal of utility poles and undergrounding of overhead wires.

Implementation: Incorporate policy direction in Planning Commission and Architectural and Site Review of projects in the Village area.

Open Space, Parks and Recreation

Policy 16: Permitted development shall not block or detract from public view to and along Capitola's shoreline.

Implementation: Incorporate policy direction in Planning Commission review of projects along shoreline.

B.11 Hazards and Hazardous Materials

City of Santa Cruz and Local Coastal Program

Goal S 6: Protect City residents and natural resources from the risks inherent in the transport, distribution, use and storage of hazardous materials and reduce the use of toxic materials, to the greatest extent possible, rather than permitting their disposal into the air, water, or land.

Policy 6.1 – Require proper storage and disposal of hazardous wastes to prevent leakage, potential explosions, fires, or escape of harmful gases, and to prevent individually innocuous materials from combining to form hazardous substances.

Policy 6.2 – Train necessary personnel to ensure that adequate resources providing quick and proper response to hazardous-waste emergencies are available.

Santa Cruz County and Local Coastal Program

There are no relevant goals and policies identified in the Santa Cruz County General Plan regarding hazardous materials.

City of Capitola

There are no relevant goals and policies identified in the Santa Cruz County General Plan regarding Hazardous Materials.

B.12 Traffic and Transportation

City of Santa Cruz General Plan and Local Coastal Program

Mass Transit: Goals, Policies and Programs

Policy 4.2 Protect existing and potential railroad lines and rights-of-way from land uses that would prevent the development of rail or fixed guideway services or other transportation related uses in the future and require developments near existing and potential rights-of-way to dedicate locations for future passenger stations and mitigate for noise and views in preparation for future transit

Road System: Goals, Policies and Programs

> **Policy 5.9.6** Prohibit contractors from tracking or dropping excavated material, construction material and other debris onto the City streets.
>
> **Policy 5.9.7** Where possible underground utilities along the City's roads and prioritize utility undergrounding on streets scheduled for reconstruction.

Policy 5.11 Ensure that roadway projects are coordinated with sewer, water and other utility work to minimize disruption of newly paved or resurfaced streets, develop consistency with City projects and minimize community disruption, and are also designed such that standards conform to Highway Design Manual Standards.

Santa Cruz County General Plan and Local Coastal Program

There are no relevant goals and policies identified in the Santa Cruz County General Plan and Local Coastal Program regarding traffic.

City of Capitola

There are no relevant goals and policies identified in the Santa Cruz County General Plan regarding traffic.

B.13 Energy

City of Santa Cruz General Plan and Local Coastal Program

Goal EQ 5: Implement, to the greatest degree possible, transportation strategies that reduce the consumption of fossil fuels, and energy strategies that increase energy-efficiency and energy conservation in all sectors of energy usage and which increase the production and use of renewable energy sources within the City.

Policy 5.1 – Meet or exceed all local and state standards for energy conservation and use in all City operations providing on-going energy management of City operations, including monitoring energy use, rate analysis, energy accounting and reports, technical support for energy-related departmental purchases, replacement of lights with high-efficiency tubes and ballasts and also replacement of older, inefficient (ozone-depleting) heating, lighting, ventilation and air condition systems.

Policy 2.3 – Ensure that new development or land uses near surface water and groundwater recharge areas do not degrade water quality

Policy 2.3.1 – Design and site development to minimize lot coverage and impervious surfaces, to limit post-development volumes, and to incorporate storm drainage facilities that reduce urban runoff pollutants to the maximum extent possible.

Santa Cruz County General Plan and Local Coastal Program

There are no relevant goals and policies identified in the City of Capitola General Plan and Local Coastal Program regarding energy.

City of Capitola

There are no relevant goals and policies identified in the City of Capitola General Plan regarding energy.

C MEMORANDUM – SOQUEL CREEK WATER DISTRICT ALTERNATIVE WATER SUPPLY PROJECT

Storage requirements for 2.5 and 3.5 mgd desalination Plant (Brown and Caldwell, 2004)

Suite 115, 201 North Civic Drive
Walnut Creek, California 94596-3864

Tel: (925) 937-9010
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BROWN AND CALDWELL

DRAFT

June 11, 2004

Mr. Brian Jordan
Black & Veatch Corporation
800 Wilshire Blvd., Suite 600
Los Angeles, California 90017

11-22202-005/5

Subject: **Soquel Creek Water District Alternative Water Supply Project–Brine Storage Requirements for 2.5 mgd and 3.5 mgd Desalination Plant – Revised Draft**

Dear Mr. Jordan:

We have completed our supplemental evaluation of brine storage requirements associated with the disposal of brine produced from the proposed desalination plant through the existing effluent outfall operated by the City of Santa Cruz (City). We performed this analysis in accordance with Brown and Caldwell's services agreement with Black & Veatch dated December 9, 2003. This letter report complements earlier reports by Brown and Caldwell including a preliminary dilution evaluation dated February 19, 2002 and an estimate of future wastewater flows dated February 21, 2002.

EXECUTIVE SUMMARY

Based on our analysis, we recommend that the City provide 0.5 million gallons (mg) of storage for the 2.5 million-gallon per day (mgd) desalination plant scenario and 1.0 mg of storage for the 3.5 mgd desalination plant scenario. This storage is needed to ensure that a minimum dilution of 114:1 (parts seawater to effluent), or an equivalent dilution factor of 115 (parts seawater plus effluent to parts effluent), is achieved at the existing outfall when the combined wastewater effluent and brine is discharged. The minimum dilution of 114:1 is stipulated in the City's current NPDES Permit (CA 0048194). This recommendation is based on a worst-case wastewater effluent flow scenario of five mgd, the average of the two minimum daily flows recorded at the City's wastewater treatment facility during the 1989-1990 drought: 4.86 mgd in October of 1989 and 5.12 mgd in October of 1990.

Dilution modeling performed as part of this study confirms that minimum dilution at the worst performing and highest flowing section of the outfall's three major sections will exceed the target dilution factor of 115 at all hours of the worst-case day. For the 2.5-mgd desalination facility, the dilution factor exceeds 190 when all brine flow is discharged to the outfall, and exceeds 150 when the brine storage basin is in use. For the 3.5-mgd desalination plant, the dilution factor exceeds 180 when all brine flow is discharged to the outfall, and exceeds 130 when the brine storage basin is in use. The average daily dilution factor under this worst-case scenario is 214 for the 2.5-mgd desalination facility and 161 for the 3.5-mgd desalination facility.

To achieve these levels of dilution, the City must ensure that the effluent and brine completely mix prior to entering the outfall. Otherwise, a two-layer flow will develop with the brine preferentially discharging from the offshore ports and the effluent discharging from the near shore ports. In this case, dilution achieved at the outfall would be substantially lower then the levels presented in this report.

A number of conservative assumptions and approaches have been used to develop the recommendations presented in this report including: a future worst-case effluent flow scenario of 5 mgd; basing dilution results on the worst performing section of the outfall; and including an storage safety factor of approximately 1.2.

PREVIOUS DILUTION ANALYSIS

The proposed addition of brine to wastewater effluent can cause the dilution achieved at the diffuser to decrease. The main mechanism for this decrease is the high salinity of the brine, which results in a higher density in the composite effluent. Since the majority of the dilution process occurs during the rise of a buoyant plume, this loss of buoyancy translates directly into a decrease in dilution. The goal of this and earlier studies has been to estimate the acceptable flow rate of brine relative to wastewater effluent to maintain the target dilution factor of 115 parts seawater plus effluent to one part effluent. Note that this dilution factor is equivalent to the minimum dilution of 114:1 parts seawater to parts effluent, which is the minimum dilution factor stipulated in the City's current NPDES Permit (CA 0048194).

A letter report dated January 19, 2002 from Brown and Caldwell to Black & Veatch and Carollo Engineers included a detailed analysis of diffuser hydraulics and dilution under a wide range of operating assumptions. Based on this comprehensive evaluation, we developed an equation that estimates the maximum brine flow that can be added to effluent while still meeting a minimum required dilution factor of 115 at the worst performing and highest flowing section of the outfall. During the summertime, when receiving waters are thermally stratified and wastewater effluent is relatively warm, and when critical drought-related effluent flows are expected, the governing equation is:

$$Q_b = -0.0207Q_e^2 + 1.114Q_e + 0.125$$

Where Q_b is the maximum brine flow and Q_e is the wastewater effluent flow. For example, if the effluent flow rate is three mgd, an acceptable brine flow is 3.3 mgd ($-0.0207 \times [3.0]^2 + 1.114[3.0] + 0.1250$). The resulting composite flow in the outfall for this case would be 6.3 mgd and the ratio of brine to effluent would be 1.1. At higher flows, while more overall brine can be added, the ratio of brine to effluent decreases. For instance, at an effluent flow of six mgd, the outfall could accept 6.06 mgd (brine to effluent ratio of 1.01). At lower flows, the brine to effluent ratio increases. At one mgd of effluent, 1.2 mgd of brine can be discharged while meeting the target dilution factor (brine to effluent ratio of 1.2). At lower flow rates, brine can make up a larger fraction of the total discharge because at lower flow rates the effluent plume is smaller and more easily mixes into the ambient water, thereby achieving higher levels of dilution.

Anticipated brine flows are 3.1-mgd for the 2.5-mgd desalination facility and 4.3-mgd from the 3.5-mgd desalination facility. This is based on a 55 percent rejection rate from the desalination facilities. Based on the relationship above, brine storage would be required if minimum effluent flows drop below 2.8 mgd for the 2.5 mgd facility (3.1 mgd brine) and below 4.1 mgd for the 3.5 mgd facility (4.3 mgd brine).

STORAGE REQUIREMENTS

Worst-Case Effluent Scenario

As discussed above, there is an upper limit to the amount of brine that can be added to the outfall, and this amount of brine is a function of the effluent flow rate. When the brine flow exceeds the acceptable flow rate, excess brine will need to be diverted to a storage area and stored for later discharge. The goal of this analysis is to estimate the size of storage under two scenarios, a 2.5 mgd desalination facility and a 3.5 mgd desalination facility, during a "worst-case" day when effluent flow is minimal. When effluent flows are low the capacity of the outfall to accept brine and still meet the target dilution factor of 115 is limited. With the proper sizing and operation of a brine storage facility, all brine can be discharged while maintaining adequate levels of dilution in the receiving water.

Current and Future Conditions. We examined available daily flow data for the City's wastewater treatment facility. Average annual and minimum daily flow rates for 2001 are approximately 10.9 mgd and 6.0 mgd, respectively. Based on flow patterns typically observed at wastewater treatment plants, minimum hourly flow is anticipated to be roughly one-fifth of the minimum day or around 1.2 mgd. Average annual effluent flow rate is expected to increase by approximately 1.6 mgd by the year 2015 (letter report dated February 15, 2002 from Brown and Caldwell to Black & Veatch). Based on this rate of increase, and assuming similar peaking factors to those for 2001 flow data, flows for 2010 and 2015 can be estimated. These flows are tabulated in Table 1. As can be seen from the table, some brine storage will be required under average conditions in the future since minimum effluent flow rates are lower than those required to continuously dispose of brine form the desalination plant. However, the size of brine storage must be based on a worst-case day when effluent flow is at a minimum.

Worst-Case Day. We based the worst-case day on minimum effluent flow rates observed during the most recent severe drought during 1989 and 1990. The minimum daily flow in 1989 occurred in October and was 4.86 mgd. The minimum daily flow in 1990 also occurred in October and was 5.12 mgd. Averaging these two low-flow episodes yields five mgd. This value was used as the worst-case day for the storage analysis. We believe it represents a conservative low-flow prediction and is an adequate flow rate on which to base the sizing of brine storage. Note that a worst-case daily flow of five mgd is about 75 percent of the estimated 6.6 mgd minimum daily flow anticipated during an average year in 2010 when the proposed desalinization facility will be in operation.

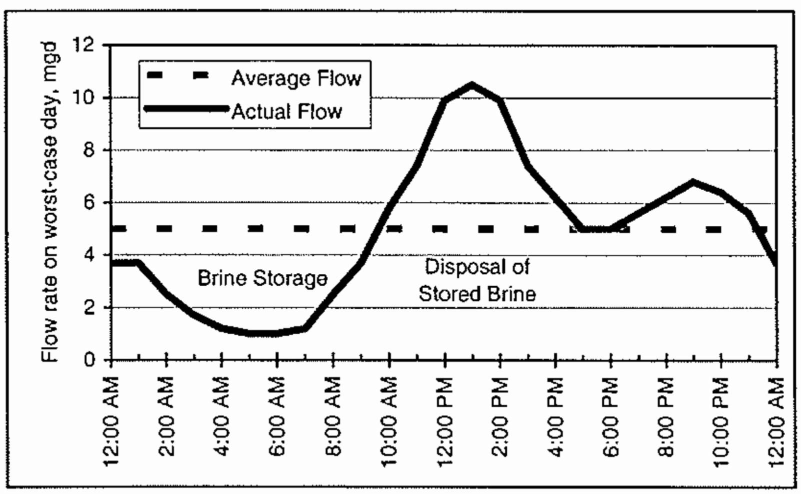
For the dilution analysis, the five mgd flow was projected onto a 24-hour day based on a typical diel patterns for wastewater flows (Wastewater Engineering, Metcalf and Eddy, 1979). Figure 1 shows the design flow pattern for the worst-case effluent flow. During the worst-case day, minimum flows on the order of one to two mgd are expected during the early-morning hours from 2 a.m. to 7 a.m. During these hours, the outfall will have limited capacity to dispose of brine, and brine will need to be stored. Peak effluent flows of seven to 11 mgd are anticipated in the early and late afternoon between 10 a.m. and 3 p.m. Excess brine stored during the morning hours will be discharged during relatively high late-morning and early-afternoon effluent flow rates.

For this preliminary dilution modeling effort, we assumed a typical diel effluent flow pattern. However, if deemed necessary, an analysis of hourly flow rates could be performed on flow data from the City's wastewater facility. We expect that such an analysis would result in slight changes in the recommendations outlined in this report.

Table 1 – Summary of Effluent Flows and Brine Storage Requirements

Year	Flow Class	Effluent flow rate, mgd	Minimum flow rate for brine disposal, mgd	Brine storage required
2001: Approximate Current Conditions	Average annual	10.9		
	Minimum day	6.0		
	Minimum hour	~1.2		
2010: Desalinization Facility at 2.5 mgd capacity	Average annual	12.0		Some storage required during low-flow conditions.
	Minimum day	6.6		
	Minimum hour	~1.3	2.8	
2015: Desalinization Facility at 2.5 mgd capacity	Average annual	12.5		Some storage required during low-flow conditions.
	Minimum day	6.9		
	Minimum hour	~1.4	4.1	
Worst-case day: drought scenario	Average annual	NA		Moderate storage required for both desalination scenarios during low-flow conditions.
	Minimum day	~5.0		
	Minimum hour	~1.0	2.8 or 4.1	

Figure 1 – Summary of Effluent Flows and Brine Storage Requirements



Brine Storage Requirements

Tables 2 and 3 summarize flow rates related to storage requirements for the 2.5-mgd and 3.5-mgd desalination scenarios for hourly time steps for the worst-case effluent flow condition of five mgd. Each table includes the following variables:

- Effluent flow rate - flow ranges from one to 10.5 mgd and averages five mgd. This is the worst-case effluent flow scenario.
- Acceptable brine flow – acceptable brine flow is set equal to effluent flow rate. This is a simplifying and conservative assumption since earlier dilution modeling shows that brine flow can slightly exceed effluent flow and still meet the target dilution factor of 115.
- Brine flow from the desalination facility - 3.1 mgd for the 2.5 mgd desalination facility and 4.3 mgd for the 3.5 mgd desalination facility.
- Brine flow to storage – this is the difference between the brine flow from the desalination facility and the acceptable brine flow.
- Cumulative volume of brine storage – a summation of brine flow to storage.
- Total outfall flow – the summation of effluent flow, brine flow from the desalination facility, and brine flow from brine storage.

The final column of the table comments of the conditions of the outfall flow. There are three conditions:

Condition 1: Effluent flow greater than brine flow. Under these conditions, all brine flow can be discharged directly via the outfall and the dilution target will be met.

Condition 2: Effluent flow less than brine flow. Under these conditions, the portion of brine exceeding the effluent flow rate must be diverted to storage in order to meet the dilution target. This condition tends to happen in the early morning when flow rates are low. A summation of the volume of brine that must be diverted yields an estimate of the required brine storage. Calculations yield a volume of 0.43 mg for the 2.5-mgd desalination facility and 0.86 mg for the 3.5-mgd desalination facility.

Condition 3: Effluent flow is large and stored brine can be discharged. Under these conditions, effluent flow is large enough that brine from both the desalination facility and brine storage can be discharged via the outfall while still meeting the target dilution. This occurs during the early morning and late afternoon when effluent flows are at a peak. Stored brine must be released in a controlled fashion such that the dilution target is met. Recommendations for rates of discharge of the stored brine are discussed below.

Table 2. Recommended Basin Storage and Operational Requirements for 2.5 mgd Desalination Plant

Time Step	Effluent flow mgd	Acceptable brine flow mgd	Brine flow from desal plant mgd	Brine flow to outfall mgd	Brine flow to storage basin mgd	Cumulative required storage mg	Total outfall flow mgd	Comments
10 to 11 PM	5.6	5.6	3.1	3.1			8.6	Effluent flow > brine flow (3.1 mgd). Discharge all brine to outfall.
11 to 12 PM	3.7	3.7	3.1	3.1			6.8	
12 to 1 AM	3.7	3.7	3.1	3.1			6.8	
1 to 2AM	2.5	2.5	3.1	2.5	0.6	0.02	5.0	Effluent flow < brine flow (3.1 mgd). Divert brine flows larger than effluent flows to storage basin.
2 to 3 AM	1.7	1.7	3.1	1.7	1.4	0.08	3.3	
3 to 4 AM	1.2	1.2	3.1	1.2	1.8	0.16	2.5	
4 to 5 AM	1.0	1.0	3.1	1.0	2.1	0.24	2.0	
5 to 6 AM	1.0	1.0	3.1	1.0	2.1	0.33	2.0	
6 to 7 AM	1.2	1.2	3.1	1.2	1.8	0.41	2.5	
7 to 8 AM	2.5	2.5	3.1	2.5	0.6	0.43	5.0	Maximum Storage Volume
8 to 9 AM	3.7	3.7	3.1	3.1	0.0	0.43	6.8	Effluent flow > brine flow (3.1 mgd). Discharge brine from desal plant to outfall. Discharge stored brine to outfall.
9 to 10 AM	5.8	4.4	3.1	4.1	-1.0	0.39	9.9	
10 to 11 AM	7.4	5.6	3.1	6.1	-3.0	0.26	13.5	
11 AM to 12 PM	9.9	7.4	3.1	6.1	-3.0	0.14	16.0	
12 to 1 PM	10.5	9.6	3.1	6.1	-3.0	0.01	16.6	
1 to 2 PM	9.9	9.1	3.1	3.5	-0.4	0.00	13.4	
2 to 3 PM	7.4	7.4	3.1	3.1			10.5	Effluent flow > brine flow (3.1 mgd). Discharge all brine to outfall.
3 to 4 PM	6.2	6.2	3.1	3.1			9.3	
4 to 5 PM	5.0	5.0	3.1	3.1			8.0	
5 to 6 PM	5.0	5.0	3.1	3.1			8.0	
6 to 7 PM	5.6	5.6	3.1	3.1			8.6	
7 to 8 PM	6.2	6.2	3.1	3.1			9.3	
8 to 9 PM	6.8	6.8	3.1	3.1			9.9	
9 to 10 PM	6.4	6.4	3.1	3.1			9.5	
Minimum	1.0	1.0	3.1	1.0	-3.0		2.0	
Average	5.0	4.7	3.1	3.1	0.0		8.1	
Peak	10.5	9.6	3.1	6.1	2.1		16.6	
Recommended Storage Volume						**0.50**		

Notes:

[1]Wastewater effluent flow based on 5 mgd drought scenario. Daily variation in wastewater effluent flow estimated from "typical" patterns reported in Wastewater Engineering (Metcalf and Eddy, 1979).

[2]Acceptable brine flow rate is equal to the wastewater flow rate. This ratio of flows will result in dilution at in outfall in excess of 114:1 target.

[3]Brine flow based on 55 percent rejection rate from the desalination plant.

Table 3. Recommended Basin Storage and Operational Requirements for 3.5 mgd Desalination Plant

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10 to 11 PM	5.6	5.6	4.3	4.3			9.9	Effluent flow > brine flow (4.3 mgd). Discharge all brine to outfall.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9 to 10 AM	5.5	5.5	4.3	5.3	-1.2	0.81	11.1	
10 to 11 AM	7.4	7.4	4.3	8.3	-2.9	0.79	15.7	
11 AM to 12 PM	9.9	9.9	4.3	8.3	-4.0	0.58	18.2	
12 to 1 PM	10.5	10.5	4.3	8.3	-4.0	0.40	18.8	
1 to 2 PM	9.9	9.9	4.3	8.3	-4.0	0.23	18.2	Effluent flow > brine flow (4.3 mgd). Discharge brine from desal plant to outfall. Discharge excess brine to outfall
2 to 3 PM	7.4	7.4	4.3	8.3	-2.9	0.15	15.7	
3 to 4 PM	6.2	6.2	4.3	5.3	-1.0	0.11	11.5	
4 to 5 PM	5.0	5.0	4.3	4.8	-0.5	0.09	9.7	
5 to 6 PM	5.0	5.0	4.3	4.8	-0.5	0.06	9.7	
6 to 7 PM	5.8	5.8	4.3	5.3	-1.0	0.02	10.9	
7 to 8 PM	6.2	6.2	4.3	4.8	-0.5	0.00	11.0	
8 to 9 PM	6.8	6.8	4.3	4.3			11.1	Effluent flow > brine flow (4.3 mgd). Discharge all brine to outfall.
9 to 10 PM	6.4	6.4	4.3	4.3			10.7	
Minimum	1.0	1.0	4.3	1.0	-4.0		2.0	
Average	5.0	5.0	4.3	4.2	0.0		9.3	
Peak	10.5	10.5	4.3	8.3	3.3		18.8	
Recommended Storage Volume						1.00		

Notes:

[1]Wastewater effluent flow based on 5 mgd drought scenario. Daily variation in wastewater effluent flow estimated from "typical" patterns reported in Wastewater Engineering (Metcalf and Eddy, 1979).

[2]Acceptable brine flow rate is equal to the wastewater flow rate. This ratio of flows will result in dilution at in outfall in excess of 114:1 target.

[3]Brine flow based on 55 percent rejection rate from the desalination plant.

Storage Recommendation

Based on the data presented in Tables 2 and 3, required storage for the 2.5-mgd desalination facility is 0.43 mg, and required storage for the 3.5-mgd desalination facility is 0.86 mg. Adding a safety factor of around 1.2 yields the recommended storage volumes of 0.5 mg for the 2.5-mgd facility and 1 mg for the 3.5-mg facility. To ensure adequate dilution at the outfall, brine flow should be diverted to storage when the brine flow rate exceeds the effluent flow rate.

Stored brine must be released at a controlled rate to ensure adequate dilution. After the effluent flow exceeds the steady brine flow from the desalination facility (3.1 mgd for the 2.5-mgd facility and 4.3 mgd for the 3.5-mgd facility), stored brine may be discharged to the outfall in addition to the steady flow of brine from the desalination facility. Tables 4 and 5 below summarize recommended discharge scenarios.

Table 4 – Recommended Rate of Stored Brine Discharge for 2.5-mgd Desalination Facility

Effluent flow rate, mgd	Rate of discharge of stored brine, mgd
>4	0.5
>5	1
>6	2
>7	3

Table 5 – Recommended Rate of Stored Brine Discharge for 3.5-mgd Desalination Facility

Effluent flow rate, mgd	Rate of discharge of stored brine, mgd
>5	0.5
>5.5	1
>6.5	2
>7.5	3
>8	4

DILUTION MODELING

In conjunction with the evaluation of brine storage, we performed numerous model runs to confirm that dilution at the outfall was adequate to meet current dilution factor target of 115, even when brine was mixed with the wastewater effluent. Since critical low-flow conditions will occur in the summer and/or fall, dilution modeling was performed assuming summer/fall conditions in the receiving waters and for the effluent.

In addition, to simplify the modeling effort we examined dilution at the worst performing and highest flowing section of the diffuser. The diffuser is made up of three major sections and an end gate. The near shore section (Section A) is around 700 feet long and includes 60 2-inch-diameter ports, of which 25 are currently open. The middle section (Section B) is around 700 feet long and contains 64 2.5-inch-diamter ports, of which 25 are currently open. The offshore section (Section C) is around 600 feet long and contains 50 3.7-inch-diameter ports, of which 20 are open. The end gate includes two 4.25-inch-diameter-ports.

As noted above, only about 40 percent of the total ports are currently open. Opening additional ports will not improve dilution since dilution is mainly controlled by the volumetric discharge per unit length of outfall. Simply opening more ports does not change this parameter. At some point in the future, likely in two to three decades, the City will open more ports in order to avoid excessive headloss through diffuser ports associated with peak flows. However, opening new ports would not significantly change the recommendations and conclusions presented in this report.

The offshore Section C, with its larger ports and shorter length, is the worst-performing section of the diffuser. It also discharges the most effluent, accounting for approximately 45 percent of the total flow rate out of the outfall. Technically speaking, the end gate has the poorest dilution characteristics, but since it only discharges 5 to 6 percent of the total flow from the outfall, its impact on receiving water quality is minor. In summary, dilution modeling was performed on the offshore section of outfall. This is a conservative approach since dilution averaged over the entire outfall is expected to be larger since the near shore and middle sections of outfall perform better.

We estimated initial dilution using PLUMES, a computer interface which supports United States Environmental Protection Agency dilution models for effluent discharge. Within PLUMES, we used the dilution model RSB, an empirical model based on years of field and laboratory experiments that is applicable for multiple-port diffusers. Dilution model inputs included flow rate, diffuser section characteristics, temperature and salinity of the composite effluent, and temperature and salinity of the receiving waters.

Brine and Effluent Water Quality

The temperature and salinity of the combined effluent was estimated based on the information outlined below. To achieve adequate levels of dilution at the outfall, the City must ensure that the effluent and brine completely mix prior to entering the outfall. Otherwise, a two-layer flow will develop within the outfall. The heavier brine will preferentially discharge from the offshore ports, while the lighter freshwater effluent will discharge from the near shore ports. In this case, dilution achieved at the outfall, particularly the offshore section, would be substantially lower then the levels presented in this report.

Brine salinity and temperature were estimated using coastal water quality data from Brown and Caldwell's Oceanographic Predesign Phase Report–Santa Cruz Effluent Facilities Planning Study (1978), assuming that the intake for the desalination plant was approximately 40 feet deep. Summer/fall conditions are the average of four profiles collected on September 22, 1976. These profiles were measured in 45 and 60 feet of water roughly one-third of a mile off of Terrence Point, Santa Cruz. Ocean water was concentrated by a factor of 1.82 based on a reverse osmosis rejection rate of 55 percent. No change in brine temperature was assumed through the treatment process. Treated wastewater effluent temperature was based on October, 2001 data. Effluent salinity was assumed to be 0.5 parts per thousand (ppt).

Table 6. Brine and Effluent Summer/Fall Water Quality

Parameter	Brine	Effluent
Temperature, °C	12.80	23.0
Salinity, ppt	61.42	0.5

Ambient Water Quality

Seasonal changes in density stratification in the receiving waters can affect dilution. For example, strong thermal stratification in the summer and fall can inhibit dilution since it hinders the upward momentum of the buoyant plume, thereby limiting mixing between the rising plume and the ambient water. In addition, brine and effluent quality changes with season, particularly effluent temperature. Summer/fall conditions were estimated based on the average of two profiles collected on September 22, 1976. These profiles were measured in 120 feet of water roughly 1.2 miles off of Terrence Point, Santa Cruz. Note the summertime thermocline at a depth of around 10 m where the water temperature drops from 13.7 to 12.7 °C with decreasing depth.

Table 7. Summer/Fall Ambient Water Quality

Depth, ft	Summer/Fall Temperature, °C	Summer/Fall Salinity, ppt
0	14.87	33.69
13	14.13	33.70
26	13.70	33.73
39	12.70	33.76
53	12.52	33.78
66	12.32	33.78
79	12.16	33.81
92	12.07	33.80
105	11.94	33.80

Dilution Modeling Results

Tables 8 and 9 summarize dilution modeling results for the 2.5-mgd and 3.5-mgd desalination scenarios for hourly time steps for worst-case effluent flow conditions of five mgd. Each table includes the effluent flow rate, brine flow rate, combined outfall flow rate, and flow rate out of the offshore diffuser section (Section C). The tables also show the temperature, salinity, and density of the composite flow out the diffuser based on the relative flow rates of effluent and brine. Finally the table shows the results of RSB dilution modeling, and each model run name, for each time step. Output for each model run is included in the Appendix of this report.

During all time steps, for both the 2.5 mgd and 3.5 mgd desalination scenarios, the dilution factor at the outfall, defined as the ratio of parts seawater plus parts effluent to parts effluent, exceeds the target of 115. For the 2.5-mgd desalination facility, dilution factor ranges from around 150 to 260 and the average daily dilution factor is

214. For the 3.5-mgd desalination plant, the dilution factor ranges from around 130 to 220 and averages 161 during the worst-case day. There are two keys to maintaining adequate dilution. First, during low effluent flow rates, the brine discharging rate must be equal to or less than the effluent flow rate. Second, stored brine must be discharged at a controlled rate relative to the effluent flow rate to ensure adequate dilution. Recommendations concerning the rate at which stored brine should be discharged are covered in the previous section.

The temporal patterns of flow rates and dilution factor are shown in Figures 2 and 3. Dilution tends to increase when total flow through the diffuser is low and when the ratio of effluent to brine is high. Lower flow rates allow for better dilution because the effluent plume is smaller and more easily mixes into the ambient water. Dilution increases as the ratio of effluent to brine increases because less brine means that the buoyancy of the effluent plume is higher, and dilution at the diffuser is directly related to the difference in density between the effluent plume and the ambient water. The less saline the effluent plume, the better the dilution.

Table 8. Dilution at Section C of Outfall During Critical Day for 2.5 mgd Desalination Plant

Time Step	Effluent flow mgd[1]	Brine flow mgd[2]	Composite flow mgd	Section C flow mgd[3]	Composite Temp °C	Composite Salinity ppt	Composite Density kg/m³	Model Run	Dilution	Comments
10 to 11 PM	5.6	3.1	8.6	3.8	17.5	22.1	1015.6	SC041	252	Effluent flow > brine flow (3.1 mgd). Discharge all brine to outfall.
11 to 12 PM	3.7	3.1	6.8	3.0	16.8	28.0	1020.2	SC042	191	
12 PM to 1 AM	3.7	3.1	6.8	3.0	16.8	28.0	1020.2	SC042	191	
1 to 2AM	2.5	2.5	5.0	2.2	16.4	31.0	1022.6	SC043	151	Effluent flow < brine flow (3.1 mgd). Divert brine flows larger than effluent flows to storage basin.
2 to 3 AM	1.7	1.7	3.3	1.5	16.4	31.0	1022.6	SC044	178	
3 to 4 AM	1.2	1.2	2.5	1.1	16.4	31.0	1022.6	SC045	204	
4 to 5 AM	1.0	1.0	2.0	0.9	16.4	31.0	1022.6	SC046	224	
5 to 6 AM	1.0	1.0	2.0	0.9	16.4	31.0	1022.6	SC046	224	
6 to 7 AM	1.2	1.2	2.5	1.1	16.4	31.0	1022.6	SC045	204	
7 to 8 AM	2.5	2.5	5.0	2.2	16.4	31.0	1022.6	SC043	151	
8 to 9 AM	3.7	3.1	6.8	3.0	16.8	28.0	1020.2	SC047	190	Effluent flow > brine flow (3.1 mgd). Discharge brine from desal plant to outfall. Discharge stored brine to outfall.
9 to 10 AM	5.8	4.1	9.9	4.3	17.0	25.5	1018.3	SC048	199	
10 to 11 AM	7.4	6.1	13.5	5.9	16.8	27.8	1020.1	SC049	152	
11 AM to 12 PM	9.9	6.1	16.0	7.0	17.3	23.6	1016.8	SC0410	178	
12 to 1 PM	10.5	6.1	16.6	7.3	17.4	22.7	1016.1	SC0411	180	
1 to 2 PM	9.9	3.5	13.4	5.9	18.1	16.2	1011.0	SC0412	240	
2 to 3 PM	7.4	3.1	10.5	4.6	17.9	18.2	1012.5	SC0413	258	Effluent flow > brine flow (3.1 mgd). Discharge all brine to outfall.
3 to 4 PM	6.2	3.1	9.3	4.1	17.6	20.6	1014.4	SC0414	262	
4 to 5 PM	5.0	3.1	8.0	3.5	17.3	23.7	1016.8	SC0415	239	
5 to 6 PM	5.0	3.1	8.0	3.5	17.3	23.7	1016.8	SC0415	239	
6 to 7 PM	5.6	3.1	8.6	3.8	17.5	22.1	1015.6	SC041	252	
7 to 8 PM	6.2	3.1	9.3	4.1	17.6	20.6	1014.4	SC0414	262	
8 to 9 PM	6.8	3.1	9.9	4.3	17.8	19.4	1013.5	SC0416	258	
9 to 10 PM	6.4	3.1	9.5	4.2	17.7	20.1	1014.0	SC0417	258	
Average	5.0	3.1	8.1						214	

Notes:
[1]Wastewater effluent flow based on 5 mgd drought scenario. Daily variation in wastewater effluent flow estimated from "typical" patterns reported in Metcalf and Eddy (Wastewater Engineering, 1979).

[2]Brine flow based on 55 percent rejection rate from the desalination plant.

[3]Section C of outfall includes twenty 3.7-inch-diameter ports. Section C has the lowest dilution of the outfall's three major sections and accounts for approximately 44% of total discharge.

Table 9. Dilution at Section C of Outfall During Critical Day for 3.5 mgd Desalination Plant

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10 to 11 PM	6.6	4.3	9.9	4.3	16.9	28.8	1018.4	[illegible]	551	Effluent flow < brine flow (4.3 mgd). Discharge all brine to outfall.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9 to 10 AM	[illegible]	4.3	15.1	[illegible]	16.6	23.5	1021.4	[illegible]	[illegible]	
10 to 11 AM	7.4	4.3	13.7	[illegible]	16.7	25.4	[illegible]	[illegible]	[illegible]	
11 AM to 12 PM	[illegible]	4.3	[illegible]	[illegible]	16.7	[illegible]	[illegible]	[illegible]	[illegible]	
12 to 1 PM	[illegible]	4.3	[illegible]	[illegible]	16.6	27.3	1016.7	[illegible]	[illegible]	
1 to 2 PM	[illegible]	4.3	[illegible]	[illegible]	16.7	[illegible]	1020.4	[illegible]	[illegible]	[illegible]
2 to 3 PM	7.4	4.3	13.7	[illegible]	16.7	25.4	[illegible]	[illegible]	[illegible]	[illegible]
3 to 4 PM	[illegible]	[illegible]	[illegible]	[illegible]	16.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4 to 5 PM	5.0	4.3	9.7	4.3	16.6	33.4	[illegible]	[illegible]	[illegible]	
5 to 6 PM	5.0	4.3	9.7	4.3	16.5	33.4	[illegible]	[illegible]	[illegible]	
6 to 7 PM	[illegible]	[illegible]	[illegible]	[illegible]	16.5	[illegible]	[illegible]	[illegible]	[illegible]	
7 to 8 PM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
8 to 9 PM	[illegible]	4.3	[illegible]	[illegible]	17.2	[illegible]	1017.1	[illegible]	307	Effluent flow > brine flow (4.3 mgd). Discharge all brine to outfall.
9 to 10 PM	6.4	4.3	10.7	4.7	17.1	[illegible]	1017.7	[illegible]	301	
Average	[illegible]	4.3	[illegible]						[illegible]	

Notes:

[1]Wastewater effluent flow based on 5 mgd drought scenario. Daily variation in wastewater effluent flow estimated from "typical" patterns reported in Metcalf and Eddy (Wastewater Engineering, 1979).

[2]Brine flow based on 55 percent rejection rate from the desalination plant.

[3]Section C of outfall includes twenty 3.7-inch-diameter ports. Section C has the lowest dilution of the outfall's three major sections and accounts for approximately 44% of total discharge.

Figure 8 – Flow and Dilution for the 2.5 mgd Desalination Facility Scenario

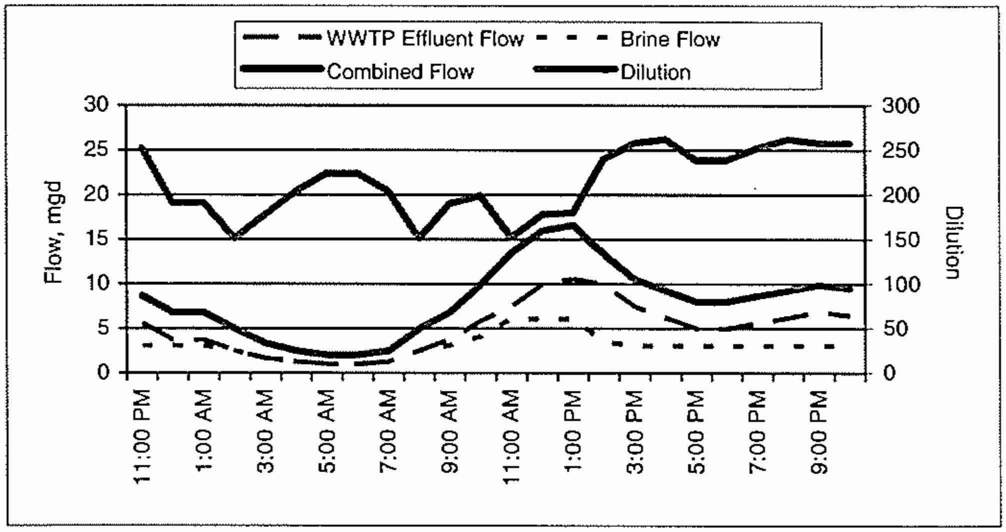
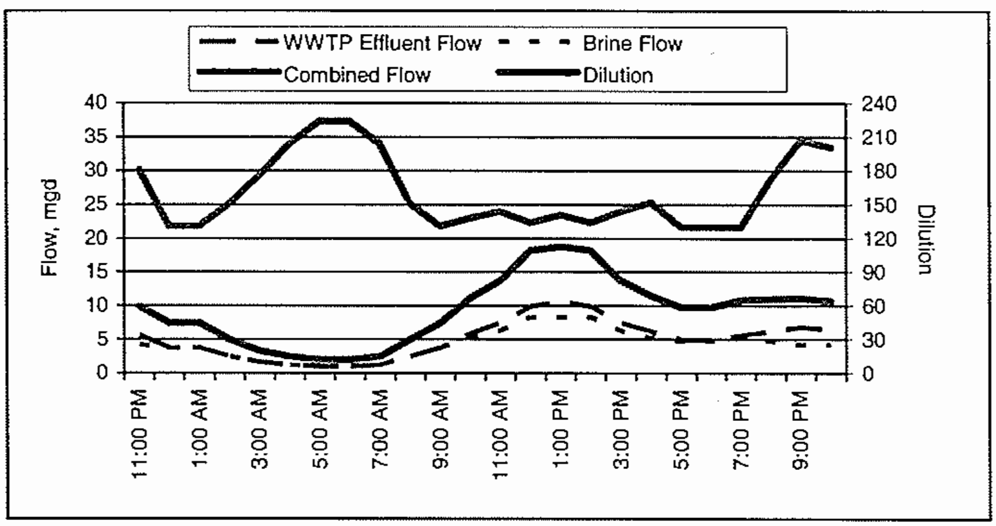


Figure 9 – Flow and Dilution for the 3.5 mgd Desalination Facility Scenario



CONCLUSION

A number of conservative assumptions and approaches have been used to develop the recommendations presented in this report. As a result, we are confident that the recommended storage volumes cited in this report, 0.5 mg for the 2.5-mgd desalination facility and 1.0 mg for the 3.5-mgd desalination facility, should meet the stated goal of permitting a controlled discharge of combined effluent and brine that exceeds the target dilution factor of 115.

Conservative assumptions and approaches used to develop the recommendations in this report include:

- A future worst-case effluent flow scenario of 5 mgd was used based on minimum effluent flow rates observed during the most recent severe drought in 1989 and 1990. This compares to minimum, average, and maximum effluent flow rates in 2001 of roughly 6, 11, and 31 mgd.

- Brine storage requirements were based on maintaining the minimum dilution factor of 115 at the worst performing section of the outfall. Dilution averaged over the entire outfall will be better than levels presented in this report by roughly 10 percent.

- The recommended storage volumes of 0.5 mg for the 2.5-mgd desalination facility and 1.0 mg for the 3.5-mgd desalination facility include a safety factor of approximately 1.2.

- Dilution of the wastewater effluent with the brine prior to discharge was neglected. When brine is added to the effluent prior to discharge, the effluent is diluted with brine. The effluent/brine mixture is then further diluted when it is discharged out the diffuser into the ocean. So, from the standpoint of the dilution of wastewater effluent, actual dilution rates are higher than those reported in this report by a factor ranging from 1 to 2 depending on the relative amount of effluent flow and brine flow.

Please note that our earlier letter report dated February 19, 2002 included a number of additional comments and recommendations concerning the use of the existing outfall to dispose of brine from the proposed desalination facility. Please consult that report for additional information on brine storage, diffuser hydraulics, trace metals, locations and methods for brine input, and corrosion.

Brown and Caldwell has appreciated the chance to work with you on this project. Please do not hesitate to contact us with any questions.

Very truly yours,

BROWN AND CALDWELL

Marc W. Beutel, PhD, PE
Project Engineer

William K. Faisst, PhD, PE
Vice President

MB

APPENDIX

PLUMES MODEL RUNS

2.5 mgd Dilution Model Runs

SC041: 10 to 11 pm time step, 3.8 mgd (Section C)

```
Jan 29, 2004,  14:27: 0  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                          nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1665      20  0.008325    9.053     22.1     17.5
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39  0.09398  0.09398    1.200     1.200    0.000     0.10      500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.4572      0.0       1.0  15.5841       100        0     12.53 1.114E-08
 hor angle red space p amb den p current  far dif   far vel K:vel/cur Stratif #
      90     9.053  25.6891 0.0001000   0.0003            12000 0.0002013
    depth   current   density  salinity     temp  amb conc  N (freq) red grav.
     0.0   0.0001  25.0099   33.685    14.87           0.01438  0.09758
       4   0.0001  25.1788    33.7    14.13        buoy flux puff-ther
       8   0.0001  25.2883   33.725   13.695        0.00008973    10.71
      12   0.0001  25.5110   33.755    12.7         jet-plume jet-cross
      16   0.0001  25.5626   33.775   12.515           1.109    999.5
      20   0.0001  25.6041    33.78    12.32         plu-cross jet-strat
      24   0.0001  25.6580    33.81    12.16         812300000    2.636
      28   0.0001  25.6683    33.8   12.065          plu-strat
      32   0.0001  25.6929    33.8   11.935            4.065
         0.0001                               hor dis>=

CORMIX1 flow category algorithm is turned off.
 12.16 deg C, 53.89 deg F                        -2.0 to 50 deg C range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;

                      RSB
        Written by Philip J. W. Roberts (12/12/89, 4/22/93)
         (Adapted by Walter E. Frick (1/12/92, 5/6/93))

 Case:  1: Santa Cruz Validation

 Lengthscale ratios are: s/lb =   3.63 lm/lb =   0.12
 Froude number, u3/b =            0.00
 Jet Froude number, Fj =        12.6

 Rise height to top of wastefield, ze =  18.5 m
 Wastefield submergence below surface =  12.9 m
 Wastefield thickness, he =            13.9 m
 Height to level of cmax, zm =          12.4 m
 Length of initial mixing region, xi =   10.0 m

 Minimum dilution,        Sm =   218.9
 Flux-average dilution, Sfa =   251.7 ( 1.15 x Sm)
 Results extrapolated beyond their experimental values, may be unreliable
 Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.
```

SC042: 11 PM to 12 AM and 12 to 1 AM time step, 3.0 mgd (Section C)

```
Jan 29, 2004,  14:45:21  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
Title   Santa Cruz Validation                                   nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp  far inc  far dis
   0.1306        20  0.006530    9.053       28       16.8     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39   0.09398   0.09398    0.9414    0.9414     0.000      0.10      500
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.4572      0.0       1.0   20.2317       100         0     13.41 2.643E-08
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90     9.053   25.6891 0.0001000    0.0003               9414 0.0003726
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0    0.0001   25.0099    33.685     14.87             0.01438   0.05246
        4    0.0001   25.1788      33.7     14.13            buoy flux puff-ther
        8    0.0001   25.2883    33.725    13.695             0.00003784   10.33
       12    0.0001   25.5110    33.755      12.7             jet-plume jet-cross
       16    0.0001   25.5626    33.775    12.515                1.186     784.0
       20    0.0001   25.6041     33.78     12.32             plu-cross jet-strat
       24    0.0001   25.6580     33.81     12.16             342600000    2.335
       28    0.0001   25.6683      33.8    12.065             plu-strat
       32    0.0001   25.6929      33.8    11.935                3.275
             0.0001                                  hor dis>=

CORMIX1 flow category algorithm is turned off.
 31.39 m, 103.0 ft, 1236 in.                              0 to 200 m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;

                              RSB
        Written by Philip J. W. Roberts (12/12/89, 4/22/93)
         (Adapted by Walter E. Frick (1/12/92, 5/6/93))

 Case:  1: Santa Cruz Validation

 Lengthscale ratios are: s/lb =   4.59 lm/lb =   0.16
 Froude number, u3/b =           0.00
 Jet Froude number, Fj =        13.4

 Rise height to top of wastefield, ze =  14.6 m
 Wastefield submergence below surface =  16.8 m
 Wastefield thickness, he =            10.9 m
 Height to level of cmax, zm =          9.8 m
 Length of initial mixing region, xi =   7.9 m

 Minimum dilution,        Sm =   165.9
 Flux-average dilution, Sfa =   190.8 ( 1.15 x Sm)
 Results extrapolated beyond their experimental values, may be unreliable
 Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.
```

SC043: 1 to 2 AM and 7 to 8 AM time step, 2.2 mgd (Section C)

```
 Feb  3, 2004,  14: 8:31  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                                  nonlinear
```

tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.09639 20 0.004820 9.053 31 16.4 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 0.6948 0.6948 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 22.6130 100 0 13.19 6.367E-08
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 6948 0.0006611

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.0001	25.0099	33.685	14.87		0.01438	0.02950
4	0.0001	25.1788	33.7	14.13		buoy flux	puff-ther
8	0.0001	25.2883	33.725	13.695		0.00001571	9.239
12	0.0001	25.5110	33.755	12.7		jet-plume	jet-cross
16	0.0001	25.5626	33.775	12.515		1.167	578.7
20	0.0001	25.6041	33.78	12.32		plu-cross	jet-strat
24	0.0001	25.6580	33.81	12.16		142200000	2.006
28	0.0001	25.6683	33.8	12.065		plu-strat	
32	0.0001	25.6929	33.8	11.935		2.629	
	0.0001				hor dis>=		

CORMIX1 flow category algorithm is turned off.
0.000 m, 0.000 ft >0.0 to any m range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 5.88 lm/lb = 0.20
Froude number, u3/b = 0.00
Jet Froude number, Fj = 13.2

Rise height to top of wastefield, ze = 11.4 m
Wastefield submergence below surface = 20.0 m
Wastefield thickness, he = 8.5 m
Height to level of cmax, zm = 7.6 m
Length of initial mixing region, xi = 6.2 m

Minimum dilution, Sm = 130.9
Flux-average dilution, Sfa = 150.6 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC044: 2 to 3 AM time step 1.5 mgd (Section C)

Feb 3, 2004, 14: 8:58 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.06572 20 0.003286 9.053 31 16.4 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 0.4737 0.4737 0.000 0.10 500

port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 22.6130 100 0 8.996 9.339E-08
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 4737 0.0006611
depth current density salinity temp amb conc N (freq) red grav.
0.0 0.0001 25.0099 33.685 14.87 0.01438 0.02950
4 0.0001 25.1788 33.7 14.13 buoy flux puff-ther
8 0.0001 25.2883 33.725 13.695 0.00001071 6.299
12 0.0001 25.5110 33.755 12.7 jet-plume jet-cross
16 0.0001 25.5626 33.775 12.515 0.7959 394.5
20 0.0001 25.6041 33.78 12.32 plu-cross jet-strat
24 0.0001 25.6580 33.81 12.16 96940000 1.656
28 0.0001 25.6683 33.8 12.065 plu-strat
32 0.0001 25.6929 33.8 11.935 2.389
0.0001 hor dis>=

CORMIX1 flow category algorithm is turned off.
0.003286 m3/s, 0.07500 MGD, 0.1160 cfs. >0.0 to ~0.1 m3/s range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 6.43 lm/lb = 0.13
Froude number, u3/b = 0.00
Jet Froude number, Fj = 9.0

Rise height to top of wastefield, ze = 10.4 m
Wastefield submergence below surface = 20.9 m
Wastefield thickness, he = 7.8 m
Height to level of cmax, zm = 7.0 m
Length of initial mixing region, xi = 5.6 m

Minimum dilution, Sm = 154.4
Flux-average dilution, Sfa = 177.5 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC045: 3 to 4 AM and 6 to 7 AM, 1.1 mgd (Section C)

Feb 3, 2004, 14: 9:11 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.04819 20 0.002409 9.053 31 16.4 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 0.3473 0.3473 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 22.6130 100 0 6.597 1.274E-07
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 3473 0.0006611

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.0001	25.0099	33.685	14.87		0.01438	0.02950
4	0.0001	25.1788	33.7	14.13		buoy flux	puff-ther
8	0.0001	25.2883	33.725	13.695		7.852E-06	4.619
12	0.0001	25.5110	33.755	12.7		jet-plume	jet-cross
16	0.0001	25.5626	33.775	12.515		0.5836	289.3
20	0.0001	25.6041	33.78	12.32		plu-cross	jet-strat
24	0.0001	25.6580	33.81	12.16		71080000	1.418
28	0.0001	25.6683	33.8	12.065		plu-strat	
32	0.0001	25.6929	33.8	11.935		2.211	
	0.0001				hor dis>=		

CORMIX1 flow category algorithm is turned off.
20 L ÷ 181 m 1 to any range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 6.89 lm/lb = 0.09
Froude number, u3/b = 0.00
Jet Froude number, Fj = 6.6

Rise height to top of wastefield, ze = 9.8 m
Wastefield submergence below surface = 21.6 m
Wastefield thickness, he = 7.3 m
Height to level of cmax, zm = 6.5 m
Length of initial mixing region, xi = 5.3 m

Minimum dilution, Sm = 177.3
Flux-average dilution, Sfa = 203.9 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC046: 4 to 5 AM and 5 to 6 AM time step, 0.9 mgd (Section C)

Feb 3, 2004, 14: 9:44 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.03943	20	0.001971	9.053	31	16.4	0.000	

port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
31.39	0.09398	0.09398	0.2842	0.2842	0.000	0.10	500

port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.4572	0.0	1.0	22.6130	100	0	5.398	1.557E-07

hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	9.053	25.6891	0.0001000	0.0003		2842	0.0006611

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.0001	25.0099	33.685	14.87		0.01438	0.02950
4	0.0001	25.1788	33.7	14.13		buoy flux	puff-ther
8	0.0001	25.2883	33.725	13.695		6.424E-06	3.779

```
12   0.0001   25.5110   33.755    12.7       jet-plume jet-cross
16   0.0001   25.5626   33.775   12.515        0.4775    236.7
20   0.0001   25.6041    33.78   12.32       plu-cross jet-strat
24   0.0001   25.6580    33.81   12.16        58160000    1.283
28   0.0001   25.6683     33.8  12.065       plu-strat
32   0.0001   25.6929     33.8  11.935          2.103
   0.0001                              hor dis>=
```

CORMIX1 flow category algorithm is turned off.

0.001971 m3/s, 0.04500 MGD, 0.06962 cfs. >0.0 to ~0.1 m3/s range

Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB

Written by Philip J. W. Roberts (12/12/89, 4/22/93)

(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 7.19 lm/lb = 0.07
Froude number, u3/b = 0.00
Jet Froude number, Fj = 5.4

Rise height to top of wastefield, ze = 9.3 m
Wastefield submergence below surface = 22.0 m
Wastefield thickness, he = 7.0 m
Height to level of cmax, zm = 6.3 m
Length of initial mixing region, xi = 5.0 m

Minimum dilution, Sm = 194.3
Flux-average dilution, Sfa = 223.5 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts

SC047: 8 to 9 AM time step, 3.0 mgd (Section C)

```
Feb 3, 2004, 14:29:37 WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:  1 of  5
Title  Santa Cruz Validation                       nonlinear
 tot flow  # ports port flow  spacing  effl sal effl temp  far inc  far dis
  0.1314      20  0.006570    9.053      28     16.8    0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398   0.9471   0.9471    0.000     0.10      500
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572      0.0      1.0  20.2317      100        0    13.49 2.627E-08
hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
     90    9.053  25.6891 0.0001000  0.0003            9471 0.0003726
   depth   current  density  salinity    temp  amb conc  N (freq) red grav.
    0.0   0.0001   25.0099   33.685    14.87           0.01438   0.05246
      4   0.0001   25.1788     33.7   14.13        buoy flux puff-ther
      8   0.0001   25.2883   33.725   13.695        0.00003807    10.40
     12   0.0001   25.5110   33.755    12.7        jet-plume jet-cross
     16   0.0001   25.5626   33.775   12.515           1.193    788.8
     20   0.0001   25.6041    33.78   12.32        plu-cross jet-strat
     24   0.0001   25.6580    33.81   12.16        344700000    2.342
     28   0.0001   25.6683     33.8  12.065        plu-strat
```

32 0.0001 25.6929 33.8 11.935 3.280
0.0001 hor dis>=

CORMIX1 flow category algorithm is turned off.
0.000 m, 0.000 ft >0.0 to any m range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 4.58 lm/lb = 0.16
Froude number, u3/b = 0.00
Jet Froude number, Fj = 13.5

Rise height to top of wastefield, ze = 14.6 m
Wastefield submergence below surface = 16.8 m
Wastefield thickness, he = 11.0 m
Height to level of cmax, zm = 9.8 m
Length of initial mixing region, xi = 7.9 m

Minimum dilution, Sm = 165.5
Flux-average dilution, Sfa = 190.3 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts

SC048: 9 to 10 AM time step, 4.3 mgd (Section C)

Mar 26, 2004, 14:34:11 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.1884 20 0.009420 9.053 25.5 17 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 1.358 1.358 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 18.2815 100 0 16.58 1.347E-08
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 13580 0.0002745
depth current density salinity temp amb conc N (freq) red grav.
0.0 0.0001 25.0099 33.685 14.87 0.01438 0.07134
4 0.0001 25.1788 33.7 14.13 buoy flux puff-ther
8 0.0001 25.2883 33.725 13.695 0.00007423 13.45
12 0.0001 25.5110 33.755 12.7 jet-plume jet-cross
16 0.0001 25.5626 33.775 12.515 1.467 1131
20 0.0001 25.6041 33.78 12.32 plu-cross jet-strat
24 0.0001 25.6580 33.81 12.16 672000000 2.804
28 0.0001 25.6683 33.8 12.065 plu-strat
32 0.0001 25.6929 33.8 11.935 3.876
0.0001 hor dis>=

CORMIX1 flow category algorithm is turned off.
m, ft >0.0 to any m range

Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.82 lm/lb = 0.18
Froude number, u3/b = 0.00
Jet Froude number, Fj = 16.6

Rise height to top of wastefield, ze = 17.5 m
Wastefield submergence below surface = 13.8 m
Wastefield thickness, he = 13.2 m
Height to level of cmax, zm = 11.8 m
Length of initial mixing region, xi = 9.5 m

Minimum dilution, Sm = 172.9
Flux-average dilution, Sfa = 198.8 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC049: 10 to 11 AM time step, 5.9 mgd (Section C)

```
Mar 26, 2004, 14:35:17 WED PROGRAM PLUMES, Ed 3.1, 8/7/95  Case:  1 of  5
Title   Santa Cruz Validation                          nonlinear
 tot flow  # ports port flow  spacing  effl sal effl temp  far inc  far dis
  0.2585       20  0.01292    9.053     27.8     16.8    0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    1.863    1.863   0.000    0.10      500
port elev ver angle cont coef  effl den poll conc    decay  Froude # Roberts F
  0.4572     0.0      1.0   20.0791      100        0    26.17 1.299E-08
hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
     90    9.053  25.6891 0.0001000  0.0003            18630 0.0003625
   depth   current  density  salinity    temp  amb conc  N (freq) red grav.
    0.0   0.0001  25.0099   33.685    14.87           0.01438   0.05393
      4   0.0001  25.1788    33.7    14.13          buoy flux puff-ther
      8   0.0001  25.2883   33.725   13.695         0.00007700    20.26
     12   0.0001  25.5110   33.755    12.7           jet-plume jet-cross
     16   0.0001  25.5626   33.775   12.515             2.315      1552
     20   0.0001  25.6041    33.78    12.32          plu-cross jet-strat
     24   0.0001  25.6580    33.81    12.16          697100000    3.285
     28   0.0001  25.6683     33.8   12.065          plu-strat
     32   0.0001  25.6929     33.8   11.935               3.912
        0.0001                              hor dis>=
```

CORMIX1 flow category algorithm is turned off.
20.0791 sigma-t, 1020.08 kg/m3, 1.02008 gm/cm3. -100 to ~200 sigma-t range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)

(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.69 lm/lb = 0.31
Froude number, u3/b = 0.00
Jet Froude number, Fj = 26.2

Rise height to top of wastefield, ze = 16.1 m
Wastefield submergence below surface = 15.3 m
Wastefield thickness, he = 12.1 m
Height to level of cmax, zm = 10.8 m
Length of initial mixing region, xi = 9.8 m

Minimum dilution, Sm = 132.1
Flux-average dilution, Sfa = 151.9 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0410: 11 AM to 12 PM and 1 to 2 PM time step, 7.0 mgd (Section C)

```
Mar 26, 2004,  14:35:57  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:  1 of  5
Title   Santa Cruz Validation                                  nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.3067       20  0.01534    9.053     23.6      17.3     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    2.211     2.211     0.000      0.10      500
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572      0.0       1.0  16.7689      100        0     24.58 6.861E-09
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
     90     9.053  25.6891 0.0001000   0.0003              22110 0.0002280
   depth   current  density  salinity     temp  amb conc  N (freq) red grav.
    0.0    0.0001   25.0099    33.685     14.87          0.01438  0.08604
      4    0.0001   25.1788     33.7    14.13        buoy flux puff-ther
      8    0.0001   25.2883    33.725    13.695        0.0001457    20.58
     12    0.0001   25.5110    33.755     12.7         jet-plume jet-cross
     16    0.0001   25.5626    33.775    12.515          2.175      1841
     20    0.0001   25.6041     33.78    12.32         plu-cross jet-strat
     24    0.0001   25.6580     33.81    12.16        1319000000    3.578
     28    0.0001   25.6683      33.8   12.065         plu-strat
     32    0.0001   25.6929      33.8   11.935            4.589
        0.0001                                hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                              >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.28 lm/lb = 0.26
Froude number, u3/b = 0.00
Jet Froude number, Fj = 24.7

Rise height to top of wastefield, ze = 19.8 m
Wastefield submergence below surface = 11.6 m
Wastefield thickness, he = 14.8 m
Height to level of cmax, zm = 13.3 m
Length of initial mixing region, xi = 11.0 m

Minimum dilution, Sm = 154.6
Flux-average dilution, Sfa = 177.8 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0411: 12 to 1 PM time step, 7.3 mgd (Section C)

```
Mar 26, 2004, 14:36:29 WED PROGRAM PLUMES, Ed 3.1, 8/7/95  Case:  1 of  5
Title   Santa Cruz Validation                        nonlinear
 tot flow  # ports port flow  spacing  effl sal effl temp  far inc  far dis
  0.3198      20  0.01599   9.053    22.7     17.4    0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398   2.305    2.305    0.000    0.10     500
port elev ver angle cont coef  effl den poll conc    decay  Froude # Roberts F
  0.4572     0.0      1.0  16.0623     100       0    24.67 6.093E-09
hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
     90    9.053  25.6891 0.0001000  0.0003           23050 0.0002113
   depth   current  density  salinity     temp  amb conc  N (freq) red grav.
    0.0   0.0001  25.0099   33.685    14.87           0.01438  0.09292
      4  0.0001  25.1788    33.7   14.13         buoy flux puff-ther
      8  0.0001  25.2883  33.725   13.695          0.0001641    20.91
     12   0.0001  25.5110   33.755    12.7         jet-plume jet-cross
     16   0.0001  25.5626   33.775   12.515           2.182     1920
     20   0.0001  25.6041    33.78    12.32        plu-cross jet-strat
     24   0.0001  25.6580    33.81    12.16       1486000000    3.653
     28   0.0001  25.6683     33.8   12.065        plu-strat
     32   0.0001  25.6929     33.8   11.935           4.727
        0.0001                              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                              >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.24 lm/lb = 0.25
Froude number, u3/b = 0.00
Jet Froude number, Fj = 24.8

Rise height to top of wastefield, ze = 20.0 m
Wastefield submergence below surface = 11.3 m
Wastefield thickness, he = 15.0 m
Height to level of cmax, zm = 13.4 m
Length of initial mixing region, xi = 11.2 m

Minimum dilution, Sm = 156.3
Flux-average dilution, Sfa = 179.7 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0412: 1 to 2 PM time step, 5.9 mgd (Section C)

```
Mar 26, 2004,  14:37:18  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:  1 of  5
Title   Santa Cruz Validation                              nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.2585       20  0.01292    9.053     16.2      18.1     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    1.863    1.863    0.000     0.10      500
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572      0.0       1.0  10.9728      100        0     16.09 4.906E-09
hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
     90     9.053  25.6891 0.0001000  0.0003            18630 0.0001382
   depth   current  density  salinity    temp  amb conc  N (freq) red grav.
    0.0   0.0001  25.0099   33.685    14.87          0.01438   0.1428
      4   0.0001  25.1788    33.7    14.13        buoy flux puff-ther
      8   0.0001  25.2883   33.725   13.695        0.0002038    14.65
     12   0.0001  25.5110   33.755     12.7        jet-plume jet-cross
     16   0.0001  25.5626   33.775   12.515           1.423      1552
     20   0.0001  25.6041    33.78   12.32         plu-cross jet-strat
     24   0.0001  25.6580    33.81   12.16       1845000000    3.285
     28   0.0001  25.6683     33.8   12.065        plu-strat
     32   0.0001  25.6929     33.8   11.935            4.990
        0.0001                              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                              >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.22 lm/lb = 0.14
Froude number, u3/b = 0.00
Jet Froude number, Fj = 16.2

Rise height to top of wastefield, ze = 20.9 m
Wastefield submergence below surface = 10.5 m
Wastefield thickness, he = 15.7 m

Height to level of cmax, zm = 14.0 m
Length of initial mixing region, xi = 11.2 m

Minimum dilution, Sm = 208.4
Flux-average dilution, Sfa = 239.7 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0413: 2 to 3 PM time step, 4.6 mgd (Section C)

```
Jan 29, 2004,  14:50:47  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
Title   Santa Cruz Validation                                 nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.2024        20  0.01012     9.053      18.2      17.9     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    1.459     1.459    0.000      0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572      0.0       1.0  12.5342      100         0    13.33 7.021E-09
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
      90     9.053  25.6891 0.0001000   0.0003              14590 0.0001546
   depth   current   density  salinity     temp  amb conc  N (freq) red grav.
     0.0   0.0001   25.0099   33.685    14.87          0.01438    0.1274
       4   0.0001   25.1788    33.7    14.13         buoy flux puff-ther
       8   0.0001   25.2883   33.725   13.695         0.0001424    11.91
      12   0.0001   25.5110   33.755    12.7          jet-plume jet-cross
      16   0.0001   25.5626   33.775   12.515            1.180      1215
      20   0.0001   25.6041    33.78   12.32          plu-cross jet-strat
      24   0.0001   25.6580   33.81    12.16         1289000000    2.906
      28   0.0001   25.6683    33.8   12.065          plu-strat
      32   0.0001   25.6929    33.8   11.935             4.562
         0.0001                                 hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                                 >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB

Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.40 lm/lb = 0.12
Froude number, u3/b = 0.00
Jet Froude number, Fj = 13.4

Rise height to top of wastefield, ze = 20.1 m
Wastefield submergence below surface = 11.3 m
Wastefield thickness, he = 15.1 m
Height to level of cmax, zm = 13.5 m
Length of initial mixing region, xi = 10.7 m

Minimum dilution, Sm = 224.0

Flux-average dilution, Sfa = 257.6 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0414: 3 to 4 PM and 7 to 8 PM time step, 4.1 mgd (Section C)

```
Jan 29, 2004,  14:59:29  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                              nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1783       20  0.008915    9.053     20.6      17.6    0.000
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39  0.09398  0.09398    1.285     1.285     0.000      0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.4572      0.0       1.0  14.4222       100         0     12.70 9.323E-09
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
      90     9.053   25.6891 0.0001000   0.0003             12850 0.0001805
    depth   current   density  salinity     temp  amb conc  N (freq) red grav.
     0.0    0.0001   25.0099    33.685    14.87            0.01438   0.1089
       4    0.0001   25.1788     33.7    14.13         buoy flux puff-ther
       8    0.0001   25.2883    33.725   13.695          0.0001073    11.06
      12    0.0001   25.5110    33.755     12.7         jet-plume jet-cross
      16    0.0001   25.5626    33.775   12.515              1.124      1070
      20    0.0001   25.6041     33.78   12.32          plu-cross jet-strat
      24    0.0001   25.6580     33.81   12.16          971100000     2.728
      28    0.0001   25.6683      33.8   12.065         plu-strat
      32    0.0001   25.6929      33.8   11.935            4.250
         0.0001                              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                               >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.46 lm/lb = 0.11
Froude number, u3/b = 0.00
Jet Froude number, Fj = 12.8

Rise height to top of wastefield, ze = 19.4 m
Wastefield submergence below surface = 12.0 m
Wastefield thickness, he = 14.6 m
Height to level of cmax, zm = 13.0 m
Length of initial mixing region, xi = 10.5 m

Minimum dilution, Sm = 227.7
Flux-average dilution, Sfa = 261.8 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0415: 4 to 5 PM and 5 to 6 PM time step, 3.5 mgd (Section C)

```
Jan 29, 2004,  17:13:29  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                              nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1547        20  0.007735     9.053      23.7       17.3      0.000
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39   0.09398   0.09398     1.115     1.115    0.000      0.10       500
 port elev ver angle cont coef  effl den poll conc      decay  Froude # Roberts F
   0.4572      0.0        1.0   16.8449       100         0     12.45 1.372E-08
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
      90      9.053   25.6891 0.0001000   0.0003               11150 0.0002299
    depth    current   density  salinity       temp  amb conc  N (freq) red grav.
     0.0    0.0001   25.0099    33.685     14.87            0.01438   0.08530
       4   0.0001   25.1788      33.7     14.13          buoy flux puff-ther
       8   0.0001   25.2883    33.725    13.695         0.00007288     10.41
      12    0.0001   25.5110    33.755      12.7          jet-plume jet-cross
      16    0.0001   25.5626    33.775    12.515              1.102     928.7
      20    0.0001   25.6041     33.78     12.32          plu-cross jet-strat
      24    0.0001   25.6580     33.81     12.16          659800000     2.541
      28    0.0001   25.6683      33.8    12.065          plu-strat
      32    0.0001   25.6929      33.8    11.935              3.859
         0.0001                                   hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                                   >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.84 lm/lb = 0.12
Froude number, u3/b = 0.00
Jet Froude number, Fj = 12.5

Rise height to top of wastefield, ze = 17.5 m
Wastefield submergence below surface = 13.9 m
Wastefield thickness, he = 13.1 m
Height to level of cmax, zm = 11.7 m
Length of initial mixing region, xi = 9.4 m

Minimum dilution, Sm = 207.9
Flux-average dilution, Sfa = 239.1 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts

SC0416: 8 to 9 PM time step, 4.3 mgd (Section C)

Jan 29, 2004, 15: 0: 4 WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case: 1 of   5

Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.1901 20 0.009505 9.053 19.4 17.8 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 1.370 1.370 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 13.4671 100 0 13.00 8.053E-09
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 13700 0.0001664
depth current density salinity temp amb conc N (freq) red grav.
0.0 0.0001 25.0099 33.685 14.87 0.01438 0.1183
4 0.0001 25.1788 33.7 14.13 buoy flux puff-ther
8 0.0001 25.2883 33.725 13.695 0.0001242 11.47
12 0.0001 25.5110 33.755 12.7 jet-plume jet-cross
16 0.0001 25.5626 33.775 12.515 1.150 1141
20 0.0001 25.6041 33.78 12.32 plu-cross jet-strat
24 0.0001 25.6580 33.81 12.16 1124000000 2.817
28 0.0001 25.6683 33.8 12.065 plu-strat
32 0.0001 25.6929 33.8 11.935 4.409
0.0001 hor dis>=

CORMIX1 flow category algorithm is turned off.
0.000 m, 0.000 ft >0.0 to any m range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.45 lm/lb = 0.12
Froude number, u3/b = 0.00
Jet Froude number, Fj = 13.1

Rise height to top of wastefield, ze = 19.8 m
Wastefield submergence below surface = 11.6 m
Wastefield thickness, he = 14.9 m
Height to level of cmax, zm = 13.3 m
Length of initial mixing region, xi = 10.5 m

Minimum dilution, Sm = 224.3
Flux-average dilution, Sfa = 258.0 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0417: 9 to 10 PM time step, 4.2 mgd (Section C)

Jan 29, 2004, 15: 0:43 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.1831 20 0.009155 9.053 20.1 17.7 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq

```
  31.39  0.09398  0.09398    1.320    1.320    0.000    0.10     500
port elev ver angle cont coef  effl den poll conc    decay  Froude # Roberts F
  0.4572      0.0       1.0  14.0206      100        0     12.82 8.762E-09
hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
     90     9.053   25.6891 0.0001000  0.0003              13200 0.0001743
   depth   current   density  salinity     temp  amb conc  N (freq) red grav.
    0.0   0.0001   25.0099   33.685    14.87          0.01438    0.1129
     4   0.0001   25.1788    33.7    14.13        buoy flux puff-ther
     8   0.0001   25.2883   33.725   13.695        0.0001141    11.22
    12   0.0001   25.5110   33.755    12.7         jet-plume jet-cross
    16   0.0001   25.5626   33.775   12.515           1.134      1099
    20   0.0001   25.6041    33.78    12.32        plu-cross jet-strat
    24   0.0001   25.6580    33.81    12.16        1033000000    2.764
    28   0.0001   25.6683     33.8   12.065        plu-strat
    32   0.0001   25.6929     33.8   11.935           4.316
       0.0001                                hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                                 >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB

Written by Philip J. W. Roberts (12/12/89, 4/22/93)

(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.49 lm/lb = 0.11
Froude number, u3/b = 0.00
Jet Froude number, Fj = 12.9

Rise height to top of wastefield, ze = 19.6 m
Wastefield submergence below surface = 11.7 m
Wastefield thickness, he = 14.7 m
Height to level of cmax, zm = 13.2 m
Length of initial mixing region, xi = 10.4 m

Minimum dilution, Sm = 224.3
Flux-average dilution, Sfa = 258.0 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

3.5 mgd Dilution Model Runs

SC041A: 10 to 11 pm time step, 4.3 mgd (Section C)

```
Feb  3, 2004,  15:31:51  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                                  nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
    0.1884        20  0.009420     9.053      26.9       16.9     0.000
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     31.39   0.09398   0.09398     1.358     1.358     0.000      0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.4572       0.0       1.0   19.3705       100         0     17.97 1.581E-08
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     9.053   25.6891 0.0001000    0.0003              13580 0.0003219
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0    0.0001   25.0099    33.685     14.87             0.01438   0.06079
         4    0.0001   25.1788      33.7     14.13           buoy flux puff-ther
         8    0.0001   25.2883    33.725    13.695          0.00006325     14.19
        12    0.0001   25.5110    33.755      12.7           jet-plume jet-cross
        16    0.0001   25.5626    33.775    12.515               1.590      1131
        20    0.0001   25.6041     33.78     12.32           plu-cross jet-strat
        24    0.0001   25.6580     33.81     12.16           572600000     2.804
        28    0.0001   25.6683      33.8    12.065            plu-strat
        32    0.0001   25.6929      33.8    11.935                3.724
            0.0001                                  hor dis>=

CORMIX1 flow category algorithm is turned off.
 m,  ft                                       >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;

                            RSB
          Written by Philip J. W. Roberts (12/12/89, 4/22/93)
           (Adapted by Walter E. Frick (1/12/92, 5/6/93))

 Case:  1: Santa Cruz Validation

 Lengthscale ratios are: s/lb =   3.98 lm/lb =   0.20
 Froude number, u3/b =           0.00
 Jet Froude number, Fj =        18.0

 Rise height to top of wastefield, ze =  16.8 m
 Wastefield submergence below surface =  14.6 m
 Wastefield thickness, he =            12.6 m
 Height to level of cmax, zm =          11.2 m
 Length of initial mixing region, xi =   9.1 m

 Minimum dilution,       Sm =   157.2
 Flux-average dilution, Sfa =   180.8 ( 1.15 x Sm)
 Results extrapolated beyond their experimental values, may be unreliable
 Roberts
```

SC042A: 11 PM to 12 AM, 12 to 1 AM, 8 to 9 AM time step, 3.5 mgd (Section C)

```
 Mar 26, 2004,  17:11:43  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
Title   Santa Cruz Validation                                  nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.1446       20  0.007230     9.053       31      16.4     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398     1.042      1.042     0.000      0.10      500
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572       0.0        1.0   22.6130       100         0      19.79 4.244E-08
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
     90     9.053  25.6891 0.0001000   0.0003              10420 0.0006611
   depth   current   density  salinity      temp  amb conc  N (freq) red grav.
    0.0   0.0001  25.0099   33.685     14.87            0.01438   0.02950
      4   0.0001  25.1788     33.7    14.13          buoy flux puff-ther
      8   0.0001  25.2883   33.725   13.695          0.00002356     13.86
     12   0.0001   25.5110   33.755     12.7           jet-plume jet-cross
     16   0.0001   25.5626   33.775   12.515              1.751     868.1
     20   0.0001   25.6041    33.78    12.32           plu-cross jet-strat
     24   0.0001   25.6580    33.81    12.16           213300000    2.457
     28   0.0001   25.6683     33.8   12.065           plu-strat
     32   0.0001   25.6929     33.8   11.935               2.910
         0.0001                                    hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                                  >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;

                      RSB
        Written by Philip J. W. Roberts (12/12/89, 4/22/93)
         (Adapted by Walter E. Frick (1/12/92, 5/6/93))

 Case:  1: Santa Cruz Validation

 Lengthscale ratios are: s/lb =   5.17 lm/lb =   0.30
 Froude number, u3/b =          0.00
 Jet Froude number, Fj =       19.8

 Rise height to top of wastefield, ze =  11.6 m
 Wastefield submergence below surface =  19.8 m
 Wastefield thickness, he =              8.7 m
 Height to level of cmax, zm =           7.8 m
 Length of initial mixing region, xi =   7.0 m

 Minimum dilution,       Sm =   113.6
 Flux-average dilution, Sfa =   130.6 ( 1.15 x Sm)
 Results extrapolated beyond their experimental values, may be unreliable
 Roberts
```

SC043A: 9 to 10 AM time step, 4.9 mgd (Section C)

```
Mar 26, 2004,  17:26:10  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case: . 1 of   5
```

```
Title   Santa Cruz Validation                                   nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.2147       20  0.01074    9.053     29.5      16.6    0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    1.548     1.548    0.000      0.10       500
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572       0.0       1.0  21.4215       100        0     24.94 2.058E-08
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
     90     9.053  25.6891 0.0001000   0.0003              15480 0.0004765
   depth   current   density  salinity     temp  amb conc  N (freq) red grav.
    0.0    0.0001   25.0099    33.685     14.87           0.01438   0.04097
      4   0.0001   25.1788     33.7     14.13         buoy flux puff-ther
      8   0.0001   25.2883    33.725    13.695        0.00004859     18.44
     12    0.0001   25.5110    33.755     12.7          jet-plume jet-cross
     16    0.0001   25.5626   33.775    12.515            2.206      1289
     20    0.0001   25.6041     33.78     12.32         plu-cross jet-strat
     24    0.0001   25.6580    33.81     12.16         439900000     2.993
     28    0.0001   25.6683     33.8    12.065         plu-strat
     32    0.0001   25.6929     33.8    11.935            3.487
        0.0001                                  hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                                >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

```
Lengthscale ratios are: s/lb =   4.19 lm/lb =   0.33
Froude number, u3/b =           0.00
Jet Froude number, Fj =        25.0

Rise height to top of wastefield, ze =  13.8 m
Wastefield submergence below surface =  17.6 m
Wastefield thickness, he =            10.4 m
Height to level of cmax, zm =           9.3 m
Length of initial mixing region, xi =   8.7 m

Minimum dilution,       Sm =   120.2
Flux-average dilution, Sfa =   138.2 ( 1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.
```

SC044A: 10 to 11 AM and 2 to 3 pm time step, 6.0 mgd (Section C)

```
Mar 26, 2004,  17:26:52  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
Title   Santa Cruz Validation                                   nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.2629       20  0.01315    9.053     28.4      16.7    0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
```

31.39 0.09398 0.09398 1.895 1.895 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 20.5592 100 0 27.84 1.397E-08
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 18950 0.0003964
depth current density salinity temp amb conc N (freq) red grav.
0.0 0.0001 25.0099 33.685 14.87 0.01438 0.04930
4 0.0001 25.1788 33.7 14.13 buoy flux puff-ther
8 0.0001 25.2883 33.725 13.695 0.00007158 21.23
12 0.0001 25.5110 33.755 12.7 jet-plume jet-cross
16 0.0001 25.5626 33.775 12.515 2.463 1578
20 0.0001 25.6041 33.78 12.32 plu-cross jet-strat
24 0.0001 25.6580 33.81 12.16 648000000 3.312
28 0.0001 25.6683 33.8 12.065 plu-strat
32 0.0001 25.6929 33.8 11.935 3.841
0.0001 hor dis>=

CORMIX1 flow category algorithm is turned off.
0.000 m, 0.000 ft >0.0 to any m range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.73 lm/lb = 0.34
Froude number, u3/b = 0.00
Jet Froude number, Fj = 27.9

Rise height to top of wastefield, ze = 15.3 m
Wastefield submergence below surface = 16.1 m
Wastefield thickness, he = 11.5 m
Height to level of cmax, zm = 10.2 m
Length of initial mixing region, xi = 9.7 m

Minimum dilution, Sm = 125.2
Flux-average dilution, Sfa = 144.0 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC045A: 11 AM to 12 PM and 1 to 2 PM time step, 8.0 mgd (Section C)

Mar 26, 2004, 17:27:33 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.3505 20 0.01753 9.053 28.2 16.7 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 2.526 2.526 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 20.4066 100 0 36.57 1.017E-08
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #

90	9.053	25.6891	0.0001000	0.0003		25260	0.0003850
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.0001	25.0099	33.685	14.87		0.01438	0.05077
4	0.0001	25.1788	33.7	14.13		buoy flux	puff-ther
8	0.0001	25.2883	33.725	13.695		0.00009828	28.03
12	0.0001	25.5110	33.755	12.7		jet-plume	jet-cross
16	0.0001	25.5626	33.775	12.515		3.236	2104
20	0.0001	25.6041	33.78	12.32		plu-cross	jet-strat
24	0.0001	25.6580	33.81	12.16		889700000	3.825
28	0.0001	25.6683·	33.8	12.065		plu-strat	
32	0.0001	25.6929	33.8	11.935		4.158	
	0.0001				hor dis>=		

CORMIX1 flow category algorithm is turned off.
16.7 deg C, 62.06 deg F -2 to ~50 deg C range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.35 lm/lb = 0.44
Froude number, u3/b = 0.00
Jet Froude number, Fj = 36.7

Rise height to top of wastefield, ze = 15.0 m
Wastefield submergence below surface = 16.4 m
Wastefield thickness, he = 11.2 m
Height to level of cmax, zm = 10.0 m
Length of initial mixing region, xi = 10.8 m

Minimum dilution, Sm = 116.3
Flux-average dilution, Sfa = 133.8 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC046A: 12 to 1 PM time step, 8.3 mgd (Section C)

Mar 26, 2004, 17:28: 7 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.3636	20	0.01818	9.053	27.3	16.8	0.000	
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
31.39	0.09398	0.09398	2.621	2.621	0.000	0.10	500
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.4572	0.0	1.0	19.6977	100	0	35.61	8.642E-09
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	9.053	25.6891	0.0001000	0.0003		26210	0.0003394
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.0001	25.0099	33.685	14.87		0.01438	0.05762
4	0.0001	25.1788	33.7	14.13		buoy flux	puff-ther

```
 8   0.0001  25.2883   33.725   13.695        0.0001157    27.88
12   0.0001  25.5110   33.755    12.7        jet-plume jet-cross
16   0.0001  25.5626   33.775   12.515          3.151     2183
20   0.0001  25.6041    33.78   12.32        plu-cross jet-strat
24   0.0001  25.6580    33.81   12.16        1048000000    3.896
28   0.0001  25.6683    33.8   12.065        plu-strat
32   0.0001  25.6929    33.8   11.935          4.331
     0.0001                              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                        >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;

                          RSB
        Written by Philip J. W. Roberts (12/12/89, 4/22/93)
         (Adapted by Walter E. Frick (1/12/92, 5/6/93))

 Case:  1: Santa Cruz Validation

 Lengthscale ratios are: s/lb =   3.23 lm/lb =   0.41
 Froude number, u3/b =           0.00
 Jet Froude number, Fj =        35.7

 Rise height to top of wastefield, ze =  16.2 m
 Wastefield submergence below surface =  15.2 m
 Wastefield thickness, he =            12.2 m
 Height to level of cmax, zm =          10.9 m
 Length of initial mixing region, xi =   11.2 m

 Minimum dilution,       Sm =   122.9
 Flux-average dilution, Sfa =   141.3 ( 1.15 x Sm)
 Results extrapolated beyond their experimental values, may be unreliable
 Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.
```

```
SC047A: 3 to 4 PM time step, 5.0 mgd (Section C)

 Mar 26, 2004,  17:29:29  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                               nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.2191        20  0.01095    9.053     28.5       16.7     0.000
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39   0.09398  0.09398    1.579     1.579    0.000     0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.4572      0.0       1.0  20.6356       100        0     23.38 1.702E-08
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
      90     9.053   25.6891 0.0001000   0.0003              15790 0.0004024
    depth   current   density  salinity     temp  amb conc  N (freq) red grav.
     0.0    0.0001   25.0099   33.685     14.87          0.01438   0.04856
      4    0.0001   25.1788     33.7     14.13         buoy flux puff-ther
      8    0.0001   25.2883    33.725    13.695        0.00005876    17.79
     12    0.0001   25.5110    33.755     12.7         jet-plume jet-cross
     16    0.0001   25.5626    33.775    12.515           2.068      1315
     20    0.0001   25.6041     33.78    12.32         plu-cross jet-strat
```

```
  24   0.0001  25.6580    33.81    12.16        532000000    3.024
  28   0.0001  25.6683     33.8   12.065        plu-strat
  32   0.0001  25.6929     33.8   11.935           3.656
     0.0001                              hor dis>=
```

CORMIX1 flow category algorithm is turned off.
16.7 deg C, 62.06 deg F -2 to ~50 deg C range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

```
Lengthscale ratios are: s/lb =  3.98 lm/lb =  0.29
Froude number, u3/b =           0.00
Jet Froude number, Fj =        23.4

Rise height to top of wastefield, ze =  15.2 m
Wastefield submergence below surface =  16.2 m
Wastefield thickness, he =            11.4 m
Height to level of cmax, zm =         10.2 m
Length of initial mixing region, xi =   9.1 m

Minimum dilution,       Sm =  131.8
Flux-average dilution, Sfa =  151.6 ( 1.15 x Sm)
```

Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC048A: 4 to 5 PM and 5 to 6 PM time step, 4.3 mgd (Section C)

```
Mar 26, 2004,  17:30: 1  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
Title   Santa Cruz Validation                               nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp  far inc  far dis
   0.1884       20  0.009420     9.053     30.4      16.5     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    1.358     1.358    0.000     0.10      500
port elev ver angle cont coef  effl den poll conc    decay  Froude # Roberts F
  0.4572      0.0       1.0  22.1317      100        0    23.98 2.816E-08
hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
     90     9.053  25.6891 0.0001000   0.0003              13580 0.0005717
   depth   current  density  salinity     temp  amb conc  N (freq) red grav.
    0.0   0.0001  25.0099   33.685    14.87           0.01438  0.03413
      4   0.0001  25.1788     33.7    14.13        buoy flux puff-ther
      8   0.0001  25.2883   33.725   13.695        0.00003552    17.20
     12   0.0001  25.5110   33.755     12.7         jet-plume jet-cross
     16   0.0001  25.5626   33.775   12.515             2.121      1131
     20   0.0001  25.6041    33.78    12.32         plu-cross jet-strat
     24   0.0001  25.6580    33.81    12.16         321500000    2.804
     28   0.0001  25.6683     33.8   12.065         plu-strat
     32   0.0001  25.6929     33.8   11.935             3.224
       0.0001                              hor dis>=
```

```
CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                           >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;

                         RSB
        Written by Philip J. W. Roberts (12/12/89, 4/22/93)
         (Adapted by Walter E. Frick (1/12/92, 5/6/93))

 Case:  1: Santa Cruz Validation

 Lengthscale ratios are: s/lb =   4.57 lm/lb =   0.34
 Froude number, u3/b =          0.00
 Jet Froude number, Fj =        24.0

 Rise height to top of wastefield, ze =  12.5 m
 Wastefield submergence below surface =  18.9 m
 Wastefield thickness, he =             9.4 m
 Height to level of cmax, zm =           8.4 m
 Length of initial mixing region, xi =    7.9 m

 Minimum dilution,       Sm =   113.0
 Flux-average dilution, Sfa =   130.0 ( 1.15 x Sm)
 Results extrapolated beyond their experimental values, may be unreliable
 Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.
```

```
SC049A: 6 to 7 PM time step, 4.8 mgd (Section C)

 Mar 26, 2004,  17:30:30  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   1 of   5
 Title   Santa Cruz Validation                          nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.2103        20  0.01051    9.053     30.1      16.5     0.000
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39   0.09398  0.09398     1.516     1.516    0.000     0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.4572       0.0       1.0  21.9024       100         0     25.94 2.369E-08
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
      90     9.053   25.6891 0.0001000    0.0003             15160 0.0005371
    depth   current  density  salinity      temp  amb conc  N (freq) red grav.
      0.0    0.0001  25.0099    33.685    14.87              0.01438   0.03634
        4    0.0001  25.1788      33.7   14.13          buoy flux puff-ther
        8    0.0001  25.2883    33.725   13.695          0.00004221      18.80
       12    0.0001  25.5110    33.755     12.7          jet-plume jet-cross
       16    0.0001  25.5626    33.775   12.515              2.295      1262
       20    0.0001  25.6041     33.78    12.32          plu-cross jet-strat
       24    0.0001  25.6580     33.81    12.16          382100000     2.963
       28    0.0001  25.6683      33.8   12.065          plu-strat
       32    0.0001  25.6929      33.8   11.935              3.366
             0.0001                            hor dis>=

 CORMIX1 flow category algorithm is turned off.
  16.5 deg C, 61.70 deg F                          -2 to ~50 deg C range
 Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

```
Lengthscale ratios are: s/lb =  4.34 lm/lb =  0.36
Froude number, u3/b =          0.00
Jet Froude number, Fj =       26.0

Rise height to top of wastefield, ze =  12.9 m
Wastefield submergence below surface =  18.5 m
Wastefield thickness, he =            9.7 m
Height to level of cmax, zm =          8.6 m
Length of initial mixing region, xi =   8.3 m

Minimum dilution,      Sm =  113.0
Flux-average dilution, Sfa =  130.0 ( 1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.
```

SC0410A: 7 to 8 PM time step, 4.8 mgd (Section C)

```
Mar 26, 2004,  17:31: 0  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:  1 of  5
 Title   Santa Cruz Validation                              nonlinear
  tot flow  # ports port flow  spacing  effl sal effl temp  far inc  far dis
   0.2103      20  0.01051    9.053      27     16.9    0.000
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    31.39  0.09398  0.09398    1.516    1.516   0.000    0.10     500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.4572     0.0      1.0  19.4467      100       0    20.18 1.434E-08
 hor angle red space p amb den p current  far dif  far vel K:vel/cur Stratif #
      90    9.053  25.6891 0.0001000   0.0003          15160 0.0003258
    depth   current   density  salinity     temp  amb conc  N (freq) red grav.
     0.0   0.0001   25.0099   33.685    14.87          0.01438   0.06005
      4   0.0001   25.1788    33.7    14.13          buoy flux puff-ther
      8   0.0001   25.2883   33.725   13.695         0.00006975    15.90
     12   0.0001   25.5110   33.755     12.7          jet-plume jet-cross
     16   0.0001   25.5626   33.775   12.515             1.785      1262
     20   0.0001   25.6041    33.78    12.32          plu-cross jet-strat
     24   0.0001   25.6580    33.81    12.16          631400000    2.963
     28   0.0001   25.6683     33.8   12.065          plu-strat
     32   0.0001   25.6929     33.8   11.935              3.817
        0.0001                               hor dis>=

CORMIX1 flow category algorithm is turned off.
 16.9 deg C, 62.42 deg F                           -2 to ~50 deg C range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.86 lm/lb = 0.23
Froude number, u3/b = 0.00
Jet Froude number, Fj = 20.2

Rise height to top of wastefield, ze = 16.8 m
Wastefield submergence below surface = 14.6 m
Wastefield thickness, he = 12.6 m
Height to level of cmax, zm = 11.3 m
Length of initial mixing region, xi = 9.4 m

Minimum dilution, Sm = 150.2
Flux-average dilution, Sfa = 172.7 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0411A: 8 to 9 PM time step, 4.9 mgd (Section C)

Mar 26, 2004, 17:31:36 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 5
Title Santa Cruz Validation nonlinear
tot flow # ports port flow spacing effl sal effl temp far inc far dis
0.2147 20 0.01074 9.053 24 17.2 0.000
port dep port dia plume dia total vel horiz vel vertl vel asp coeff print frq
31.39 0.09398 0.09398 1.548 1.548 0.000 0.10 500
port elev ver angle cont coef effl den poll conc decay Froude # Roberts F
0.4572 0.0 1.0 17.0953 100 0 17.54 1.018E-08
hor angle red space p amb den p current far dif far vel K:vel/cur Stratif #
90 9.053 25.6891 0.0001000 0.0003 15480 0.0002366
depth current density salinity temp amb conc N (freq) red grav.
0.0 0.0001 25.0099 33.685 14.87 0.01438 0.08286
4 0.0001 25.1788 33.7 14.13 buoy flux puff-ther
8 0.0001 25.2883 33.725 13.695 0.00009826 14.59
12 0.0001 25.5110 33.755 12.7 jet-plume jet-cross
16 0.0001 25.5626 33.775 12.515 1.551 1289
20 0.0001 25.6041 33.78 12.32 plu-cross jet-strat
24 0.0001 25.6580 33.81 12.16 889500000 2.993
28 0.0001 25.6683 33.8 12.065 plu-strat
32 0.0001 25.6929 33.8 11.935 4.158
0.0001 hor dis>=

CORMIX1 flow category algorithm is turned off.
0.000 m, 0.000 ft >0.0 to any m range
Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: SCF6.VAR;

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.54 lm/lb = 0.18

Froude number, u3/b = 0.00
Jet Froude number, Fj = 17.6

Rise height to top of wastefield, ze = 18.9 m
Wastefield submergence below surface = 12.5 m
Wastefield thickness, he = 14.2 m
Height to level of cmax, zm = 12.7 m
Length of initial mixing region, xi = 10.2 m

Minimum dilution, Sm = 179.7
Flux-average dilution, Sfa = 206.6 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts Fr. # < 0.1 (aspiration dominated), no avg. flux dilution formed
No farfield prediction when far vel = 0.

SC0412A: 9 to 10 PM time step, 4.7 mgd (Section C)

```
Mar 26, 2004,  17:32: 1  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:  1 of  5
Title   Santa Cruz Validation                             nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.2059       20   0.01030    9.053     24.8      17.1     0.000
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   31.39  0.09398  0.09398    1.484    1.484    0.000     0.10      500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
  0.4572     0.0       1.0  17.7263       100        0     17.48 1.146E-08
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
     90     9.053  25.6891 0.0001000   0.0003              14840 0.0002554
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
     0.0    0.0001   25.0099   33.685    14.87            0.01438   0.07673
      4    0.0001   25.1788    33.7    14.13          buoy flux puff-ther
      8    0.0001   25.2883   33.725   13.695          0.00008726     14.35
     12    0.0001   25.5110   33.755     12.7           jet-plume jet-cross
     16    0.0001   25.5626   33.775   12.515              1.546     1236
     20    0.0001   25.6041    33.78    12.32           plu-cross jet-strat
     24    0.0001   25.6580    33.81    12.16           790000000     2.931
     28    0.0001   25.6683     33.8   12.065           plu-strat
     32    0.0001   25.6929     33.8   11.935               4.036
          0.0001                                   hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.000 m, 0.000 ft                                 >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:NTNO0.  FILE: SCF6.VAR;
```

RSB
Written by Philip J. W. Roberts (12/12/89, 4/22/93)
(Adapted by Walter E. Frick (1/12/92, 5/6/93))

Case: 1: Santa Cruz Validation

Lengthscale ratios are: s/lb = 3.65 lm/lb = 0.18
Froude number, u3/b = 0.00
Jet Froude number, Fj = 17.5

Rise height to top of wastefield, ze = 18.3 m

Wastefield submergence below surface = 13.1 m
Wastefield thickness, he = 13.7 m
Height to level of cmax, zm = 12.3 m
Length of initial mixing region, xi = 9.9 m

Minimum dilution, Sm = 174.4
Flux-average dilution, Sfa = 200.5 (1.15 x Sm)
Results extrapolated beyond their experimental values, may be unreliable
Roberts

D PRELIMINARY HYDROGEOLOGICAL STUDY (Hopkins Groundwater Consultants, 2004)

HOPKINS GROUNDWATER CONSULTANTS, INC.

PRELIMINARY HYDROGEOLOGICAL STUDY

CITY OF SANTA CRUZ
INTEGRATED WATER PLAN
ENVIRONMENTAL IMPACT REPORT
SUPPLEMENTAL STUDY
LIVE OAK, CALIFORNIA

Prepared for:
CITY OF SANTA CRUZ

September 2004

CITY OF
SANTA CRUZ

HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

September 15, 2004
Project No. 01-010-04

City of Santa Cruz
c/o Law Offices of
Atchison, Barisone, Condotti & Kovacevich
333 Church Street
Santa Cruz, California 95060

Attention: Mr. John Barisone
City of Santa Cruz Attorney

Subject: Preliminary Hydrogeological Study, City of Santa Cruz Integrated Water Plan Environmental Impact Report Supplemental Study, Live Oak California.

Dear Mr. Barisone:

Hopkins Groundwater Consultants, Inc. (Hopkins) is pleased to submit this final report summarizing the findings, conclusions, and recommended mitigation measures that were developed as part of a preliminary groundwater resource impacts study that focused on groundwater production from the City of Santa Cruz (City) Live Oak well field located in the County of Santa Cruz, California. The study was performed to supplement the City environmental review process that is being conducted for the implementation of the City Integrated Water Plan.

We trust this preliminary hydrogeological study is sufficient for the needs of the City of Santa Cruz. If you have any questions or need additional information, please give us a call.

REGISTERED GEOLOGIST
CURTIS J. HOPKINS
EG NO. 1800
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

Curtis J. Hopkins
Principal Hydrogeologist
Certified Engineering Geologist EG 1800
Certified Hydrogeologist HG 114

Report Copies Submitted: (6) Six

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CONTENTS

TABLES

PLATES

APPENDICES

INTRODUCTION

General Statement

The City of Santa Cruz (City) Integrated Water Plan (IWP) includes the supply of groundwater from the City Live Oak well field as part of its future City water supply. This preliminary hydrogeological study of potential groundwater impacts has been conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) to assist the City in understanding what groundwater impacts may occur as a result of its continued historical groundwater production as indicated in the IWP. The area of study is shown on Plate I – Study Area Location Map. The purpose of this study is to identify specific groundwater impacts and to the extent practicable, determine the potential level of significance and measures that may be considered to mitigate any potentially significant impacts. At the time of this study there was no available, reliable, comprehensive 3-dimensional groundwater basin model that could be utilized for numerical simulation of basin responses to the proposed City groundwater production. This study utilized readily available data provided by the City, Soquel Creek Water District (SCWD), and the County of Santa Cruz (County), and applicable portions of the SCWD conceptual model (Johnson, et. al., 2004) that was concurrently being compiled at the time of study.

Proposed Live Oak Well Field Operations

The City's Live Oak well field has been a vital component of its water supply system since its acquisition from the Beltz Water Company in 1964. In 1986, the Beltz Treatment Plant was expanded from its original 1 million gallons per day (mgd) capacity to 2 mgd capacity. The presently active wells are designated as Beltz Wells 7, 8, and 9 and have a combined capacity of approximately 1,500 gallons per minute (gpm). Historically, the City has used the groundwater during a period of 150 to 200 days out of the year at a combined operational rate of about 1 mgd on average but at 2 mgd during the extended drought in 1987 and 1988. A summary of annual pumping volumes recorded since 1972 (when metering began) is provided in Table 1 – City of Santa Cruz Annual Groundwater Production. As indicated in the IWP, the future operation of the Live Oak well field will be conducted on this same basis with operation at approximately 1 mgd during the summer of an average year and operation at 2 mgd only during a drought or critical dry year when surface water supplies fall short. The annual demand during dry years may be as high as 400 million gallons (mg) per year (see Table 1). The historical operation of the Live Oak wells in this manner has provided a vital component of supply to the City system, particularly during dry years when surface water supply is low. The continued use of the City wells is proposed to be the same with or without the proposed supplemental water supply to be provided by an ocean water desalination plant.

Table 1 – City of Santa Cruz Annual Groundwater Production

CALENDAR YEAR	BELTZ WELLS PRODUCTION (AFY)	BELTZ WELLS PRODUCTION (MGY)	CALENDAR YEAR	BELTZ WELLS PRODUCTION (AFY)	BELTZ WELLS PRODUCTION (MGY)
1972	817	266.24	1989	916	298.60
1973	660	214.92	1990	698	227.44
1974	420	136.88	1991	549	178.74
1975	378	123.11	1992	811	264.40
1976	763	248.72	1993	416	135.46
1977	148	48.15	1994	519	169.07
1978	262	85.50	1995	276	90.00
1979	26	8.47	1996	168	54.70
1980	105	34.24	1997	245	79.90
1981	462	150.50	1998	306	99.56
1982	235	76.62	1999	284	92.44
1983	309	100.53	2000	574	187.00
1984	446	145.32	2001	526	171.35
1985	536	174.66	2002	546	177.88
1986	103	33.58	2003	407	132.5
1987	1,196	389.61	MAXIMUM	1,319	429.77
1988	1,319	429.77	MINIMUM	26	8.47
(1972 TO 2003) 32-YEAR AVERAGE				482	157.06
(1986 TO 2003) 17-YEAR AVERAGE				574	186.97
(2000 TO 2003) 4-YEAR AVERAGE				513	167.18

The historical Live Oak well field production data indicate that between 1972 and 2003 the 32-year annual average is approximately 157 mgy (482 acre-feet per year [afy]). Since construction of the Beltz Treatment Facility the annual average rose over the subsequent 17-year period to approximately 187 mgy (574 afy). The production levels recorded in the most recent 4-year period (2000 to 2003) since construction and operation of the new Live Oak replacement wells (Beltz Well Nos. 8 and 9) has averaged approximately 167 mgy (513 afy) (see Table 1). For the purpose of this study the impacts are evaluated for the difference between the average production over the last 4-years (167 mgy) and the projected future operation consistent with historical operation of up to 400 mgy.

FINDINGS

Local Hydrogeology

The entire production of the City Live Oak well field is derived from groundwater contained in the Purisima Formation. The Purisima Formation is comprised of multiple interbedded coarse- and fine-grained layers that form a confined/leaky-confined bedrock aquifer system. The primary aquifer units consist of fine to coarse grained marine sands that are interbedded with sandy silt and sandy clay strata that serve as confining layers. Aquifer zone delineation within the Purisima Formation was established by previous studies using a lettering system to identify individual zones that were correlated between borings that were drilled along the coastline (L&S, 1984). The City well field location overlies the basal portion of the Purisima Formation and produces water from the aquifer subunits designated as the A and AA zones.

Local Groundwater Conditions

Recent efforts to compile and analyze hydrogeological data that were collected to the east and southeast of the Live Oak area have been conducted by the SCWD (L&S, 2003, Johnson et. al., 2004). General observations of water levels and the chloride concentrations that were reported near the Live Oak area are provided in Table 2 – Aquifer Zone Conditions 1983 to 2003. A map of the well locations used for historical monitoring is included on Plate 2 – Well Location Map. As part of the latest groundwater conditions study conducted by the SCWD of the Soquel-Aptos area (L&S, 2003), groundwater quality was evaluated by reviewing the range of chloride concentration throughout the sample period (1983 to 2003). Chloride concentrations in the Purisima Aquifer subunits designated as the AA, A, B, and C subunits ranged between 8 milligrams per liter (mg/l) and 210 mg/l over the 24 year observation period (see Table 2). These concentrations are typical of fresh water aquifer zones where quality is influenced by pumping stresses that induce seepage from interbedded leaky confining layers of fine silt and clay. These layers typically contain poorer quality water that can seep into the more permeable aquifer strata when a significant pressure differential is created by long term pumping. These data alone do not appear to indicate seawater intrusion occurred at the monitored locations during the observation period. However, subsequent review of additional water quality constituents indicates seawater intrusion may be occurring in the vicinity of the SCWD Garnet Well, and SC-1A monitoring well which are located in the Capitola area adjacent the Live Oak well field (Johnson et. al., 2004).

Available water level data indicate that the observed groundwater elevations are higher in the progressively shallower aquifer subunits in the SCWD east of the Live Oak area. This condition is likely because these units are more readily recharged and have a lower annual pumping demand. Reportedly, the Purisima A and AA zones provide approximately 90 to 95 percent of the estimated groundwater produced from the Purisima Formation at the present time.

Table 2 – Aquifer Zone Conditions 1983 to 2003

WELL NUMBER	RANGE OF CHLORIDE CONCENTRATIONS (MG/L)	RANGE OF STATIC WATER LEVELS (FEET AMSL)	AVERAGE SEASONAL WATER LEVEL CHANGE (FEET)
PURISIMA C SUBUNIT			
WELL SC-5C	100 TO 210	36 TO 50	2 TO 5
WELL SC-3C	30 TO 60	50 TO 65	2 TO 5
PURISIMA B SUBUNIT			
WELL SC-5B	70 TO 185	11 TO 26	2 TO 5
WELL SC-3B	25 TO 45	20 TO 45	5 TO 15
WELL SC-1B	2 TO 85	8 TO 20	5 TO 10
PURISIMA A AND AA SUBUNITS			
WELL SC 13A	60 TO 114	-25 TO 55	10 TO 20
WELL SC-9A	13 TO 70	-21 TO 12	20 TO 30
WELL SC-5A	8 TO 94	-21 TO 13	15 TO 20
WELL SC-3A	21 TO 66	-15 TO 12	10 TO 15
WELL SC-1A	21 TO 47	-3 TO 13	2 TO 5
PLEASURE POINT WELLS	21 TO 168	-10 TO 18	2 TO 5

DATA SOURCE (L&S, 2003) AND CITY OF SANTA CRUZ WATER DEPARTMENT

The Purisima Aquifer is comprised of multiple aquifer layers separated by leaky confining layers. Groundwater in this system migrates from one permeable layer to the next and is driven by the relative head difference between the aquifer strata. The rate of flow is controlled by the hydraulic conductivity of the finer-grained strata that separate them. As a result, groundwater pumped from the Purisima A subunit is partially replenished by groundwater storage that is released from the Purisima AA and B subunits which lie below and above the A zone, respectively. Similarly the Purisima B subunit is believed to receive recharge from the overlying C subunit when a downward pressure gradient exists between the 2 zones. This leaky confined condition controls the radius of influence and the magnitude of drawdown that is observed at variable distances from a production well.

During the 24-year observation period, water levels in the Purisima C subunit reportedly ranged between elevations of 36 and 65 feet above mean sea level (amsl) at well locations along the coastline between Capitola and Aptos (L&S 2003). Given these observed basin conditions, the movement of groundwater through this aquifer zone would be directed into the underlying B subunit, possibly into overlying D subunit, and offshore. Because groundwater elevations in the C zone were maintained at a level well above sea level throughout the entire observation period, the underlying zones were protected from vertical migration of seawater in the areas of C Zone coverage (i.e., the central and southern portion of the SCWD). Similarly, the B Zone water level data indicate groundwater elevations remained between 8 and 45 feet amsl during the observation period and effectively provided the same form of vertical hydraulic protection for the underlying A and AA Zones where they lie beneath its area of coverage.

Groundwater monitoring points are relatively scarce toward the western end of the SCWD service area. The lack of data has historically precluded the ability to confidently contour the water table in the Live Oak area. The City has recently constructed a series of coastal monitoring wells and modified the construction of old production wells to allow for future collection of groundwater data. Available data indicate that at the present time the groundwater elevations near the Live Oak coastline likely fluctuate between levels at or below sea level to several feet above sea level. The historical changes in water levels are shown on the groundwater hydrographs included in Appendix A – Capitola and Live Oak Area Groundwater Hydrographs. The groundwater elevation in Well No. SC-13A during the year 2002 ranged between a low elevation of approximately -4 feet below mean sea level and a high of about 8 feet amsl (L&S, 2003). These data are reportedly representative of the Purisima AA subunit. Located approximately 900 feet south of this location, Well No. SC-1A indicates that groundwater elevations along the shoreline fluctuated between 0 and 2 feet amsl in the Purisima A subunit and are currently marginally above mean sea level. Data available from the City Pleasure Point monitoring well at this same time indicate the water table remained semi-stable at an elevation of about 10 feet amsl. Although data from these wells appear to indicate that historical production has resulted in water levels that are sufficient to abate salt water intrusion, recent observations indicate the coastal monitoring well water levels can fluctuate as much as 2 feet because of tidal influence.

Available data indicate that coastal water levels in the western portion of SCWD, adjacent the Live Oak area, have declined significantly in the A zone since 1994. Table 3 – Well Production Versus Water Level Changes correlates recent changes in the City and SCWD well production, and periods of notable water level trends in the western portion of the SCWD service area (District). City production records indicate that groundwater demand peaked in 1987 and 1988 and averaged a production of 1,256 afy. During those 2 years the A subunit water level elevations remained above sea level in the SCWD area (see information for Well Nos. SC-1A and SC-13A in Table 3), but were believed to have dipped below sea level at the City Pleasure Point monitoring well. As SCWD began to redistribute pumping between 1989 and 1994, Well No. SC-13A showed a decline of about 25 feet while Well No. SC-1A water levels rose an average of 3 feet (during a period of reduced City pumping). After the City wells sustained damage and production decreased to an average of 255 afy during the 5 year period of 1995 to 1999, average water levels were observed to decline in well SC-1A (see Table 3) while they rose in the Pleasure Point monitoring well to an average of 14 feet amsl. This is believed to be a direct result of SCWD relocation of pumping and represents a significant decline in coastal water levels. Subsequent pumping of the City's newly constructed wells began in the year 2000 and averaged 178 mgy (548 afy) through the year 2002. During this period the SCWD Purisima A subunit monitoring well SC-1A declined to an average elevation of 2 feet amsl and the City Pleasure Point well declined to about 12 feet amsl.

Table 3 – Well Production Versus Water Level Changes

TIME PERIOD	CITY AVERAGE ANNUAL PRODUCTION (ACRE-FEET) (MILLION GALLONS)	SCWD AVERAGE ANNUAL PRODUCTION (ACRE-FEET) (MILLION GALLONS)	WATER LEVEL TREND PLEASURE POINT (A-ZONE)	WATER LEVEL TREND WELL NO. SC-1A (A-ZONE)	WATER LEVEL TREND WELL NO. SC-13A (AA-ZONE)	WATER LEVEL TREND WELL NO. SC-5B (B-ZONE)	WATER LEVEL TREND WELL NO. SC-5C (C-ZONE)
1987-1988	1,256 AF 410 MG	3,200 AF 1,042 MG	NOT AVAILABLE	AVE 8 FT AMSL	AVE 40 FT AMSL	DECLINED TO AVE 15 FT AMSL	DECLINED TO AVE 42 FT AMSL
1989-1994	650 AF 200 MG	3,275 AF 1,067 MG	ROSE TO AVE 3 FT AMSL	ROSE TO AVE 11 FT AMSL	DECLINED TO AVE 5 FT AMSL	DECLINED TO AVE 13 FT AMSL	DECLINED TO AVE 38 FT AMSL
1995-1999	255 AF 83 MG	3,515 AF 1,145 MG	ROSE TO AVE 14 FT AMSL	DECLINED TO AVE 5 FT AMSL	AVE 5 FT AMSL	ROSE TO AVE 20 FT AMSL	ROSE TO AVE 48 FT AMSL
2000-2002	548 AF 178 MG	3,411 AF 1,111 MG	DECLINED TO AVE 12 FT AMSL	DECLINED TO AVE 2 FT AMSL	AVE 5 FT AMSL	AVE 20 FT AMSL	AVE 48 FT AMSL

These water level data appear to indicate a downward trend has developed and that the SCWD well placement strategy of relocating wells and concentrating groundwater production along the western portion of its service district has likely impaired the City's ability to maintain production and favorable coastal groundwater conditions. The only aquifer zones that are available for production beneath the City water service district (which lies west of 41st street) are the Purisima A and AA subunits. Historical geological data generated in the Live Oak area indicate that the Purisima A and AA subunits are overlain by the Purisima B zone in the offshore area located to the east of the City's Live Oak (Beltz) well field. Plate 3 – Outcrop Areas of Purisima Formation Subunits shows the approximate location where the contact between the AA, A, and B subunits intersect the ground surface. Projection of the subunit contacts was based on geophysical data obtained from well drilling operations. Plate 4 - Hydrogeological Cross-Section A-A', shows the Purisima subunits near the offshore outcrop area and how they dip to the southeast. Saltwater intrusion into the A and AA aquifer zones from the southeast direction could occur if it leaks vertically through the overlying B zone. These subunits are consequently protected by favorable conditions in the Purisima B subunit (i.e., groundwater elevations above sea level). However, immediately southeast, south, and west of the City well field, the Purisima A and AA subunits outcrop at locations that lie offshore and along the coastline where there are likely little or no overlying layers to provide protection from saltwater inflow. At these locations, the only aquifer zones that are available for production by the City's well field are directly susceptible to seawater intrusion.

SCWD pumping redistribution has been a limited success in regards to stabilizing coastal water levels. The A zone water levels have mostly stabilized in the central portion of the district with minor increases (at best) while water levels have declined in the western end of the District. This condition has shifted the threat of seawater intrusion to a more critical location. The potential for seawater intrusion is greater under these conditions than in the past when the Purisima A zone water level depression was located in the central portion of the District beneath overlying protecting layers. The depressed water level conditions will likely jeopardize the City's ability to maintain its annual groundwater supply during a drought when Purisima groundwater levels have been historically lower than levels observed during normal and wet periods.

Available data indicate that since 1994 water levels in the central portion of the District have notably stabilized and risen in the B and C subunits (see Plate A4). This is believed a reflection of the redistribution of pumping stresses, from the A, AA, B, and C subunits in the central portion of the District, to the Purisima A and AA subunits in the western portion of the District. This condition is allowing additional water to flow offshore into the ocean through the B and C zones at the expense of causing depressed water levels in the A and AA subunits (the only aquifer zones available for production by the City). Offshore flow must be maintained in all aquifer zones to prevent the landward movement of saltwater into the Purisima aquifer system. The amount of piezometric head required to prevent saltwater intrusion is unique to each aquifer zone and its condition of exposure along the shoreline (i.e., aquifer depth, thickness, and permeability). Available data indicate that historical increases and redistribution of basin-wide groundwater production will require additional monitoring and management of coastal water level elevations (in each discrete aquifer subunit) to maintain favorable conditions.

Data available from the SCWD inland monitoring Well Nos. 10 A and 10 AA (see Plate A5) indicate that gradual trends have occurred over the last 20 years. The AA subunit water levels have declined gradually from an average elevation of approximately 82 feet amsl to approximately 76 feet amsl. Although this may not be a significant change, it is a steady trend that will likely decrease the amount of groundwater recharge that reaches the coastal area of the aquifer system. This trend is believed to be a result of increased inland groundwater production from private well owners in the Santa Cruz County Area. The A subunit monitoring well has conversely shown a steady water level or very slight rise over the same period. Average water level elevations have risen from approximately 68 feet amsl to approximately 70 feet amsl and may be a reflection of the decrease in production that resulted from pumping redistribution located down gradient in the central portion of the District or increased groundwater recharge provided by the wet weather cycle.

Project Alternatives

No-Project Alternative

The No-Project alternative leaves the City's Live Oak well field groundwater production as the only water supply available for increased production during a drought. During the 31-year pumping period between 1972 and 2002 the City produced an average of 156.7 mgy (481 afy) from the Live Oak well field. The maximum amount of groundwater pumped during a single year (since 1972 when record keeping started) was in 1988 when the City produced about 430 mg (1,319 af). Conversely, in 1979 the City only produced 8.4 mg (26 af). The wide range of groundwater production is in direct response to surface water availability to the City system and varies yearly based on hydrologic conditions. However, the proposed historical use of groundwater does not provide sufficient supply to meet the future dry-year demand projections for the City water system.

City-Only Alternative

The City-Only Project alternative will allow the City to develop a supplemental supply that is provided by a seawater desalination plant and can be used to satisfy the present demand during the times that supply shortages occur. The planned use of groundwater from the Live Oak well field that is included with this IWP alternative is consistent with historical use (and the No-Project alternative). Groundwater production will provide a supply of 1 mgd for up to 200 days each year under average hydrologic conditions. During dry-year conditions the City will operate the well field to produce up to 2 mgd and would potentially produce up to 400 mg per year. This alternative does not change historical groundwater use patterns; however, it provides the supplemental desalinated supply that will allow the City to reduce its projected curtailment from 45 to 15 percent during a drought. Although drought curtailment of water use under this project alternative is 15 percent, irrigation can still occur and will likely add some component to groundwater recharge that would not occur under a 45 percent curtailment requirement.

Cooperative Alternative

The Cooperative Project alternative would consist of a partnering arrangement between the City and the SCWD to develop a supplemental supply that is provided by an ocean water desalination plant and would be shared by the two agencies. The project would include a supply to offset the projected City water supply shortages and an additional supply of desalted water for the SCWD's use during the normal and wet weather years, and probably limited use in drier years. The proposed supply could be used by SCWD to offset groundwater pumping that has been observed to create localized adverse conditions. The water supply provided by the Cooperative alternative would serve to change SCWD's complete reliance on groundwater as its sole water supply. This project alternative would permit a reduction in the SCWD groundwater production that has led to an estimated groundwater basin overdraft of approximately 600 afy (L&S, 1999). The Cooperative supply alternative allows for both water purveyors to continue use of existing groundwater supplies and would cooperatively augment the supply of both agencies in preparation for dry year demands.

This alternative provides the greatest potential benefit to the groundwater basin by providing a supply to each major groundwater user which could prevent the need to increase the future use of the limited groundwater resources. In this context, the Cooperative Project alternative provides a greater potential to mitigate future impacts to the Purisima Formation aquifer system from over pumping. In addition to offsetting SCWD groundwater demand in normal and wet years, the imported water into the City and SCWD would allow less restrictive rationing during a drought and therefore provide a proportional component of additional groundwater recharge that would be derived from irrigation return flows. If the Cooperative Project is not implemented, the SCWD curtailment of water use during a drought will likely be significantly greater.

Potential Groundwater Impacts

For the purpose of this study the impacts of future Beltz Well field operations consistent with historical operations will be assessed against the production levels recorded in the most recent 4-year period (2000 to 2003), since the construction and operation of the new Live Oak replacement wells (Beltz Well Nos. 8 and 9). During this time period the City's annual production of groundwater from the Purisima Formation has averaged approximately 167 mgy (513 afy) (see Table 1). Potential groundwater impacts associated with the proposed IWP project alternatives have been assessed against this average level of groundwater production and have been grouped into four categories. The categories are listed in Table 4 – Potential Groundwater Impacts Summary. Each alternative is rated with regard to the level of significance the City IWP project and cumulative Purisima Formation groundwater extractions could potentially have on each impact category. The cumulative impacts listed in Table 4 consider the effect of all current and planned future groundwater uses, both private and municipal, that pump from the Purisima Formation. The only known planned future groundwater facilities are SCWD's O'Neil Ranch Well plus those required to support general predictions of increased groundwater extractions from SCWD (Brown, 1998) and private pumpers. A discussion of the potential impacts is provided in the following report sections.

Table 4 – Potential Groundwater Impacts Summary

POTENTIAL IMPACT		NO-PROJECT ALTERNATIVE	CITY-ONLY ALTERNATIVE	COOPERATIVE ALTERNATIVE
AQUIFER STORAGE DEPLETION	PROJECT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT
	CUMULATIVE	POTENTIALLY SIGNIFICANT	POTENTIALLY SIGNIFICANT	POTENTIALLY SIGNIFICANT
WELL INTERFERENCE	PROJECT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT
	CUMULATIVE	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT
STREAM FLOW DEPLETION	PROJECT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT
	CUMULATIVE	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT
SEAWATER INTRUSION	PROJECT	POTENTIALLY SIGNIFICANT	POTENTIALLY SIGNIFICANT	LESS THAN SIGNIFICANT
	CUMULATIVE	POTENTIALLY SIGNIFICANT	POTENTIALLY SIGNIFICANT	POTENTIALLY SIGNIFICANT
SUBSIDENCE	PROJECT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT
	CUMULATIVE	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT	LESS THAN SIGNIFICANT

Depletion of Groundwater in Storage (A and AA Zones)

City well operations have been documented for over 30 years and as previously indicated, they vary based on well facilities conditions and changes in hydrological conditions. Well production records indicate the magnitude of annual extractions from the City Live Oak wells. Water level data for the Live Oak wells include water level measurements collected from idle production wells and coastal monitoring wells that were installed by the SCWD and the City since 1983. These data indicate that water levels across the Purisima basin have been impacted (lowered) by changes in pumping patterns and the gradual increase in overall groundwater production. Water levels in the leaky-confined coastal aquifer zones are indicative of the amount of groundwater stored inland and moving down through the aquifer system. The resulting water level at any given location is a balance of the local and regional dynamics of recharge to, and extraction from, the aquifer system. The inland capture of groundwater within the A and AA subunits removes groundwater stored within the aquifer system and moving through the system, and prevents the down gradient extraction of that water. Water level elevation trends indicate the increase or decrease of available groundwater in storage, relative to sea level.

In all IWP alternatives the City proposes to produce groundwater from the Purisima aquifer system in a manner consistent with historical production. The City Beltz wells produced an annual average of approximately 198 mgy (608 afy) during the 5-year period between 1972 and 1976. During that same 5-year period, SCWD's entire Purisima Formation production was on average approximately 750 mgy (2,300 afy). Since that time, the SCWD increased production from the Purisima Formation an average of over 40 percent and presently produces approximately 1,075 mgy (3,300 afy). In addition, numerous private inland wells have been installed over the last 30 years and have increased demand on the groundwater system. Private well production is currently estimated to total about 728 mgy (2,236 afy) (Johnson, et. al., 2004). Therefore, because the City's historical production has been a small part of the total extractions from the Purisima Formation (approximately 10 percent), and because the percentage has and will continue to decrease as SCWD and private well extractions increase, all IWP alternatives will not contribute to additional aquifer storage depletion and are considered to have a less than significant impact on groundwater storage within the basin.

Annual extractions from the Purisima aquifer system have grown to an annual amount that is estimated at over 1,600 mgy (5,000 afy). Any use by the City (even continued historical use) is part of a cumulative impact that includes pumping by other users of the basin, namely SCWD and private pumpers. Because the groundwater basin has recently been reported to be in overdraft, and pumping by SCWD and private pumpers is predicted to grow, we can only conclude the cumulative impact of all pumpers (including the City), for all three IWP alternatives is significant. It should be noted that the ability of the City to use groundwater at a level of 2 mgd during a drought may be significantly impaired because of local groundwater storage depletion that is believed to have been caused by cumulative impacts of increased inland pumping and pumping redistribution that has occurred within the basin since the last drought. The Cooperative Project alternative could be a beneficial impact and result in an increase in available groundwater storage. This could elevate water levels across the basin and correct the declining trend observed in the A and AA subunits, however it would only delay storage impacts due to future increases in basin extractions.

In 2003 the City delivered 1,120 mg of treated water to the Live Oak and Santa Cruz Gardens areas of its water service area. The water is used primarily for residential and commercial applications. These two communities overlie the outcrop areas of both the Purisima A and AA subunits. Consistent with past studies (Wolcott, 1999), this study has assumed that an estimated 50 percent of all water deliveries are applied for outdoor use as irrigation, and that 80 percent of the water applied as irrigation is consumed by evapotranspiration processes. The resulting amount (roughly 10 percent of the total water delivered) will move into deep percolation and contribute to groundwater recharge. The estimated amount that the City contributes to annual groundwater recharge into the underlying Purisima aquifer zones through water deliveries is approximately 112 mgy (343 afy). This amount is well over half of the City's annual groundwater extractions from the Live Oak well field in normal climatic water years. A majority of the City water deliveries that become groundwater recharge is imported from the North Coast, San Lorenzo River, and Loch Lomond Reservoir water supplies. As City water demand has grown in the Live Oak area, groundwater recharge from imported supplies has increased. Future groundwater recharge would also derive a component from IWP desalinated water deliveries under the City-only and Cooperative Project alternatives. Although these IWP project alternatives do not change City historical groundwater use patterns; they will provide the supplemental desalinated supply that will allow the City to reduce its curtailment from 45 percent to 15 percent during a drought. Under a 15 percent drought curtailment of water use, irrigation can still occur and will likely add some component to groundwater recharge that would not occur under a 45 percent curtailment requirement where irrigation would be virtually nonexistent.

Well Interference

Groundwater impacts for this study were initially estimated using the cumulative production of the Live Oak well field and calculating distance-drawdown values after 200 days of continuous operation. Drawdown estimations were calculated using a 2-dimensional analysis provided by the aquifer test solution software AQTESOLV™. The results of this analysis are shown on Plate 5 – Aquifer Drawdown Projections. As shown, drawdown analyses for various aquifer conditions were projected. For this analysis an aquifer transmissivity value of 30,000 gallons per day per foot was utilized. The results are considered conservative because this value may be slightly lower than actual aquifer values (Fugro, 1998, and Johnson et al., 2004) and will result in predicting greater drawdown values than what would actually occur in an aquifer with a higher transmissivity value. The calculated values have been compared to seasonal drawdown data historically provided from the existing Pleasure Point monitoring well (see Appendix A) and water level data from the remaining idle Live Oak wells. Correlating these predicted aquifer responses with available monitoring well data indicated that the Purisima Aquifer system behaves as a leaky confined system that responds similarly to the Hantush leaky confined solution (see Plate 5). Plates 6 and 7 – Water Level Drawdown at 1 MGD Production and 2 MGD Production, respectively, show contours of these drawdown interference values that are calculated from the historical average production rate of 1 mgd, and the increased production rate of 2 mgd during a drought. The projected water level drawdowns at specific points of interest are summarized in Table 5 – Estimated Drawdown From Live Oak Well Field Production and was calculated using the average distance from the 3 presently active wells (Beltz 7, 8, and 9).

As indicated, the drawdown estimated at these points of interest during normal well field operation (1 mgd) is half of the value estimated during drought-related operation (2 mgd) (see Table 5). Evaluation of groundwater pumping impacts using these projections provides a level of understanding sufficient to determine the environmental effects historical pumping and future pumping will have on the features of interest.

Table 5 – Estimated Drawdown From Live Oak Well Field Production

WATER BODY OR WATER WELL FACILITY	DISTANCE FROM CITY WELLS (FEET)			AVERAGE DISTANCE (FEET)	A & AA-ZONE DRAWDOWN 1 MGD (FEET)	A & AA-ZONE DRAWDOWN 2 MGD (FEET)
	BELTZ 7	BELTZ 8	BELTZ 9			
SOQUEL CREEK	5,800	5,000	6,800	5,870	0.1	0.2
MORAN LAKE	3,100	3,700	1,500	2,770	1.7	3.5
CORCORAN LAGOON	2,200	3,100	1,800	2,370	2.0	4.0
SCHWAN LAKE	5,700	6,600	5,700	6,000	0.1	0.2
RODEO CREEK	1,200	2,000	1,500	1,570	3.2	6.5
ARANA GULCH CREEK	8,300	9,000	8,600	8,630	0.0	0.0
OCEAN OUTCROP	4,000	4,800	2,200	3,670	1.2	2.4
SCWD GARNET WELL	4,700	3,800	5,700	4,730	0.4	0.9
SCWD MAIN STREET WELL	10,300	9,800	11,500	10,530	0.0	0.0
SCWD ROSEDALE WELL	10,100	9,100	11,200	10,130	0.0	0.0
SCWD MONTEREY WELL	10,100	9,000	11,100	10,070	0.0	0.0

DISTANCE AND DRAWDOWN ESTIMATES ARE AT THE CLOSEST POINT OF THE WATER BODY LISTED
DRAWDOWN WAS BASED ON 200 DAYS OF CONTINUOUS OPERATION
WELLS LISTED ARE OWNED BY SCWD

The City of Santa Cruz IWP alternatives all propose to operate the Live Oak well field in a manner consistent with historical practices. Historical City operation of the Live Oak well field has not significantly impacted proximate wells or existing groundwater users, historically documented by the collection of City well data over the last 32 years. Because the closest reported historical water well is greater than a 2,000-foot distance from the well field, continued City production is not anticipated to significantly impact adjacent water well users. As indicated by the calculated projections, a well at a distance of 2,000 feet may experience a drawdown effect of up to 3 feet under normal operation (1 mgd) and up to 6 feet of drawdown during drought operation (2 mgd). The calculated drawdown values at the nearest SCWD well are less than 1 foot under all proposed pumping conditions (see Table 5). These levels of interference drawdown are periodic and considered tolerable (less than significant).

The analysis is the same when considering cumulative impacts because there are very few local wells in the vicinity of the Live Oak well field that are believed to be producing the same historical amount of groundwater, and there are no new wells in the vicinity that are proposed for construction. Therefore, no additional localized drawdown is anticipated and cumulative well interference effects are less than significant for all project alternatives.

Stream Flow or Surface Water Depletion

Flow paths through the Purisima aquifer system include movement of groundwater from one aquifer subunit to another (vertical seepage), discharge of groundwater to mountain streams (base flow), and discharge of groundwater to the ocean through offshore outcrop areas (off shore discharge). Groundwater movement is controlled by the formation geometry and hydraulic conductivity of the subsurface materials and the hydraulic gradient that exists at any point in time. Geologically, the subsurface materials are stable and relatively unchanging. The groundwater gradient is dynamic and changes locally and regionally due to effects from both natural and man-made factors that include climatic weather patterns and extraction from wells. These factors affect the groundwater flow-direction on a seasonal and long-term basis.

The magnitude of affect a groundwater extraction facility has on a surface water body is variable and influenced by factors that include the local hydrogeology (preferential flow paths), the proximity of the extraction to a water body (induced flow path), and the amount of groundwater production (induced flow gradient). The leaky-confined condition of the Purisima aquifer groundwater system indicates that any well will affect vertical flow between aquifer zones. Depending on the magnitude of well production, the affect may be immeasurable or a significant component of the local groundwater flow that moves to the point of discharge. Ultimately, the amount of vertical leakage will be a result of existing preferential flow paths in the aquifer system and the amount of stress induced by the extraction facility.

Wells located within older alluvium or permeable bedrock units adjacent to a flowing stream or surface water body may derive a majority of its production from the stream or from groundwater base flow feeding the stream. Thus, numerous shallow, small capacity well facilities could have a far greater affect on surface waters than a high capacity deep well located a considerable distance from the surface water feature. Deeper wells may derive a greater component of their production from groundwater that would have been subsurface underflow that contributes to offshore discharge. However, both groundwater extraction scenarios may contribute to a cumulative affect on the surface water body.

Wells located along the coastline typically do not have a significant potential to decrease stream base flows inland, but rather they have a significant potential to induce the onshore flow of seawater into the aquifer system. This condition results primarily because the groundwater captured by coastal wells is largely derived from offshore discharge and there are no streams or freshwater bodies located within that radius of capture located offshore. The groundwater gradient created by coastal pumping may be decreased by the constant recharge boundary that is controlled by sea level. While the shoreline recharge effect controls the groundwater gradient and the water level drawdown effect from pumping, it can adversely impact water quality.

Numerous studies have been conducted to determine the magnitude of impact historical groundwater extractions have had on regional stream flows. Significant study has been conducted to specifically determine the aquifer/stream flow interaction along the lower reaches of Soquel Creek. Study results have demonstrated that losing and gaining stream flow reaches exist and they cumulatively result in the historically observed stream flow rates. Studies have been inconclusive, however, regarding impacts of groundwater extractions on stream flow (LKA/L&S, 2003) and (Johnson, et al., 2004). As shown on Plates 6 and 7, the change in the groundwater gradient beneath the Soquel Creek is between 0.4 and 0.9 feet at a location where the top of the A zone (which supplies water to City wells) is approximately 40 feet below sea level. The City well field is located a considerable distance from most sensitive surface water features (including Soquel Creek) and as indicated by the groundwater drawdown projections (see Table 5, and Plates 6 and 7), production under all project alternatives will have a less than significant impact on them. Because the City's well field is located in the lowest end of the watershed and the primary component of produced groundwater is offshore flow that would otherwise be discharged to the ocean, the impact from all City project alternatives is designated as less than significant.

Coastal lagoons in the Live Oak area derive their water source from the inflow of inland streams and from the ocean under high tide conditions. Groundwater production effects on coastal estuaries or lagoons are diminished by the presence of fine grained silt, clay, and organic deposits that commonly have hydraulic conductivity values in the range of 1×10^{-5} to 1×10^{-7} centimeters per second, and effectively seal the bottom of the shoreline water bodies and impede vertical leakage. This condition, when considered with the inconclusive studies of the SCWD causes us to conclude that the cumulative pumping of the basin under all IWP alternatives will also have a less than significant impact on these water bodies.

Seawater Intrusion

The supply shortage projected for the City water system during a critical dry year cannot be produced from the Live Oak well field (when the City expects to pump groundwater at 2 mgd), without creating an intolerable significant impact (sea water intrusion). The potential for drought condition pumping to create adverse conditions is documented by coastal water levels that were measured in the Pleasure Point monitoring well following the 1987 and 1988 production period (see Appendix A Plate A6 and A7). The historical production during those dry years resulted in water levels along the coast that were at or below sea level and clearly indicate that increasing the demand on the Purisima Formation, beyond historical amounts, would exacerbate this condition. Because the City's plans to pump groundwater are the same for both the No-Project and the City-Only alternatives, the seawater intrusion impacts for both alternatives (given existing basin conditions) are considered potentially significant during a drought. The Cooperative Project alternative, however, would provide a means for SCWD to reduce its pumping and reverse the groundwater overdraft trend. This measure could restore coastal water levels in the Live Oak area and could allow historical well production by the City with a less than significant impact.

The potential impact from the City's future groundwater use (assuming historical use patterns) could vary from insignificant during the normal and wet years, to potentially significant during the below average rainfall years and extended drought conditions. Although the impact of continued City Live Oak well field operations has not changed over the last 30 years, the impact created by increased groundwater use outside of the City service area during this same time period has created a potentially significant cumulative impact. In addition, the cumulative impact of groundwater use may become more significant in the future because there is no comprehensive groundwater management agency that is empowered to control potential changes in pumping patterns or the increasing demand of wells constructed in the Purisima Formation aquifers outside the City's service area and outside the SCWD jurisdiction. Impacts associated with the cumulative groundwater use by all pumpers, including the City, can not be mitigated if another supply is not available and if uncontrolled demand is allowed to exceed the safe yield of the aquifer system.

The groundwater produced from City facilities comprises a relatively small portion of the total groundwater basin extractions (about 10 percent). The coastal location of the Live Oak wells is the closest area of groundwater extraction that is proximate to the offshore outcrop of the A and AA subunits (see Plate 3). This results in the City being the last pumper to capture groundwater that would otherwise become offshore flow. The approximate location where the contact between the AA, A, and B subunits intersect the ground surface near the shoreline is shown on Plate 3. The large colored arrows indicate the direction of direct seawater intrusion into the offshore outcrop area of each subunit. Conversely, during high groundwater level conditions, groundwater flows offshore in the opposite direction. The Purisima subunits near the offshore outcrop area dip to the southeast (see Plate 4). Saltwater intrusion into the A and AA aquifer zones from the southeast direction could occur if it leaks vertically across the overlying B zone.

Historical data indicate the groundwater gradient in the Live Oak area is relatively flat and, when unaffected by pumping, slopes toward the ocean (the direction of greatest discharge). Under historical pumping patterns the groundwater levels have typically ranged between sea level and approximately 20 feet amsl and vary based on available recharge and local groundwater extraction rates. As indicated by recent conditions that have developed over the last 10 years (during a wet climatic cycle), additional inland pumping has lowered the amount of offshore flow (discharge) that is available for capture by the City well field. This adverse condition has resulted in a greater potential for seawater intrusion to occur even without increased production.

Available data indicate that normal production patterns (1 mgd) are sustainable with less than significant impacts from seawater intrusion. However, increased production during a drought cycle may have the potential to induce seawater intrusion. The lower groundwater levels east of the City well field (the west Capitola area) indicate that during normal climatic years there is less groundwater in storage in this portion of the groundwater basin. Storage that was formerly accumulated during wet and normal years (as indicated by higher water levels) is relied upon when increased production is needed in dry years (as indicated by declining water levels). In addition, the offshore gradient created during wet years drives out saltwater that may have entered the aquifer outcrop during drought year pumping. The decreased groundwater storage condition may cause a significant impact by inducing saltwater migration into the aquifer system sooner during drought-related pumping. For this reason the proposed use of the Live Oak well field, in a historical fashion, is listed as a potentially significant impact with regard to seawater intrusion for the No-Project and the City-Only alternatives. Because uncontrolled inland pumping will only exacerbate this condition, the cumulative impact is designated as potentially significant under all proposed IWP alternatives.

Subsidence

Groundwater extraction from loose unconsolidated fine-grained sediment has historically been observed to result in ground surface subsidence. The subsidence potential in a consolidated formation like the Purisima Formation is considered very low because the sediment has been compressed through burial prior to the tectonic uplift which has placed it at its present elevation. The Purisima Formation has also been dewatered by historical pumping in the Live Oak area in the same amount as will occur during future pumping and no subsidence has been reported. The process of dewatering unconsolidated fine-grained silt and clay deposits (reducing the pore pressure) is what allows compression of those types of deposits. Because the subsurface materials in the Live Oak area have already been subjected to low water level conditions, consolidation would have already occurred during those periods (if the materials were susceptible). Considering that the magnitude of drawdown caused by City pumping is so small, and that the Purisima Formation is consolidated, the impact from City well operation as well as cumulative extractions from all pumpers under all IWP alternatives is designated as less than significant.

CONCLUSIONS AND RECOMMENDATIONS

The findings of this study support the need to develop mitigation measures that will address the potentially significant groundwater impacts that could occur in the vicinity of the Live Oak well field. The successful implementation of the mitigation measures identified in this study will largely depend on the ability to further define and regionally manage the groundwater resources within the Purisima Formation aquifer system. The mitigation measures listed below provide both local and regional solutions that may be required to manage the potentially significant effects of groundwater production proposed by the City in the Live Oak area under all project alternatives, particularly under cumulative scenarios that factor in increased pumping by private entities and the SCWD. The implementation of these measures may require the cooperative efforts of entities other than the City.

Potential Mitigation Measures

1. Construct an effective monitoring well system, coordinated with SCWD, to allow data collection for use in groundwater basin management and in preventing seawater intrusion. Have an implementable plan that will reduce pumping when certain seawater indicators are observed.

2. Transfer pumping regionally and vertically within the Purisima Formation aquifer system. Transference of pumping could only occur under a cooperative arrangement with the SCWD and in its service area where additional aquifer zones are present and the A and AA zones are located deeper and further from the offshore outcrop area.

3. Develop new surface water supplies, such as the Cooperative Project alternative, to offset groundwater production.

4. Implement an emergency response plan with mandatory water conservation (reduction in use from 15 to 30 percent).

5. Form a comprehensive Purisima Formation groundwater basin management agency to develop effective supply protection and management strategies equitable to all pumpers

Measure 1 – Install and Monitor Coastal Monitoring Wells in the Live Oak Area

The City's well field in the Live Oak area is concentrated within a small section of coastline. The greatest distance separating any two production wells is approximately 2,000 feet. The tight well spacing makes the well field vulnerable to any kind of groundwater contamination including seawater intrusion. The primary benefit of this mitigation measure is to provide protection against salt water intrusion from the ocean outcrop areas and potentially the proximate salt water lagoons. We recommend the City evaluate its existing coastal monitoring well network and determine if installation of additional wells is necessary. The monitoring well network should be routinely monitored year-round to develop a detailed understanding of the basin responses to climatic conditions and water well pumping. The data collected from the monitoring wells can be utilized to assess the coastal condition of the A and AA zones and to indicate when curtailment of pumping may be necessary and/or when to shift groundwater demand to another location within the basin. This mitigation measure will allow groundwater data collection that will support future groundwater management of the entire Purisima Formation aquifer system.

Measure 2 – Transfer Pumping Within the Purisima Formation

The present level of understanding about the hydrogeology of the Purisima Formation indicates that groundwater withdrawals can be strategically located to balance water supply demands and coastal water levels to mitigate associated impacts. The City could relocate the aging Beltz Well 4 to a location further inland to allow cessation of pumping from a well closer to the shoreline (i.e., Beltz Well 9). This would decrease the groundwater gradient near the shoreline and may allow for sustained pumping under drought conditions.

During a drought the City may request that the SCWD redistribute pumping from the western portion of its service District back to the central and inland portions of the District in order to balance resource supply. This transfer of groundwater extraction could create a water table depression in the A zone in an area where the aquifer has greater protection (provided by the overlying B and C zones) and allow the City to achieve its historically higher production in a time of greatest need. This may require that the City discuss the potential for the SCWD to eliminate or severely restrict the use of the Garnet Well as a substantial source of supply during drought conditions.

The City water service district does not overlie the shallower subunits of the Purisima formation (B and C zones), however, the SCWD does. Discrete redistribution of pumping within these aquifer subunits of the Purisima Formation could potentially capture available water resources and increase the perennial yield of the Purisima Formation. Development of this mitigation measure would require cooperation and funding on behalf of the SCWD and could be further explored.

Measure 3 – Construct the Cooperative Project Alternative

The Cooperative Project alternative is capable of providing greater benefits than the No-Project or the City-Only Project alternatives by providing water to the greatest single groundwater pumper in the Purisima aquifer system. The ability to provide SCWD with a decreased reliance on groundwater will assist in mitigating stream flow depletion, aquifer storage depletion, and consequently seawater intrusion issues. This offset of SCWD's groundwater use by desalination plant production will also contribute to the avoidance of interruption of the City's historical Live Oak well field supply.

Measure 4 - Mandatory Water Use Reduction

Mitigation of groundwater impacts during a drought or other water emergency can be accomplished by implementing water rationing in the form of a mandatory water use reduction program. While this measure is possible, the magnitude of water conservation necessary to make it practicable makes this mitigation measure temporary and partially effective at best. The City has included in the IWP a mandatory water use reduction of 15 percent. The City can raise the percentage of reduced use during an extended drought to 30 percent. However, this mitigation will be far more effective if the County and the SCWD worked cooperatively and developed similar water use curtailment strategies.

Measure 5 – Establish a Regional Groundwater Management Agency

Develop a regional groundwater management agency (GMA) that is empowered to collect data and build a comprehensive basin-wide database for equitable curtailment of use or expansion of supply through mutually funded projects.

Preferred Mitigation Measures

We recommend the City pursue implementation of the Cooperative Project alternative (Measure 3) and participate in developing a comprehensive basin-wide GMA (Measure 5) that can regionally regulate over pumping of the groundwater basin. While implementation of the Cooperative Project alternative will mitigate all potential IWP impacts, only the formation of an effective GMA will mitigate the potential significant cumulative impacts identified in Table 4 for seawater intrusion, and the depletion of groundwater in storage. Mandatory water rationing may be a necessary mitigation measure until the full implementation of the Cooperative alternative and GMA mitigation measures can be implemented.

We recognize that the City has already developed components of Mitigation Measure 4 that will be implemented within its service area. In addition, we recognize that during the course of this study the City has made significant progress toward development of mitigation Measure 1 by installing 5 coastal monitoring wells that are located in the Live Oak area between 41st

Avenue and Schwan Lake (see Plate 2). These wells will provide valuable data that will help indicate basin conditions and that can be used to guide future decisions considered by a basin-wide GMA.

CLOSURE

This report has been prepared for the exclusive use of the City of Santa Cruz and its agents for specific application to the City Integrated Water Plan Environmental Impact Report being conducted as part of the City water supply improvement project located in County of Santa Cruz, California. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted hydrogeological engineering and planning practices. No other warranty, express or implied is made.

□

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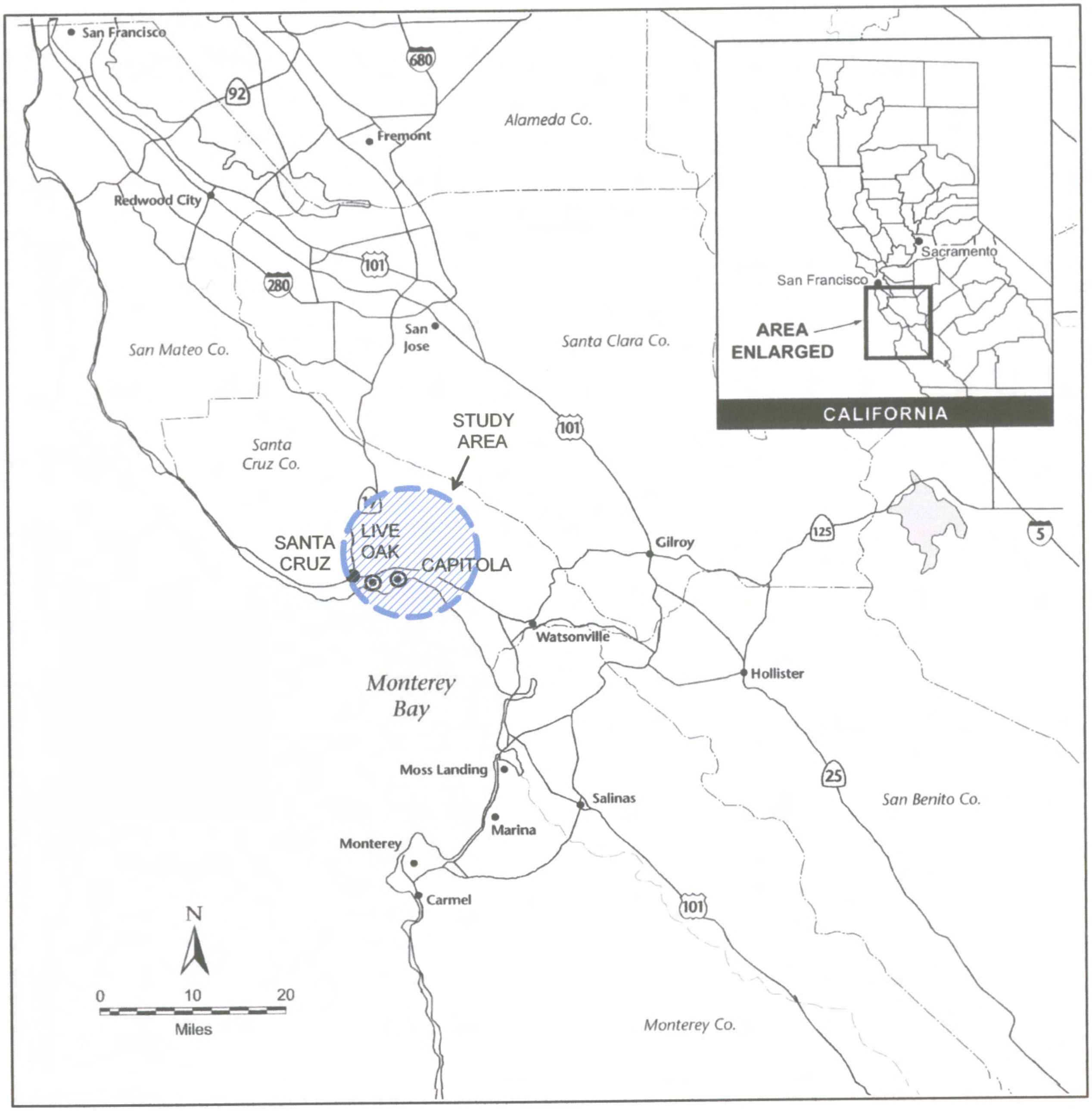
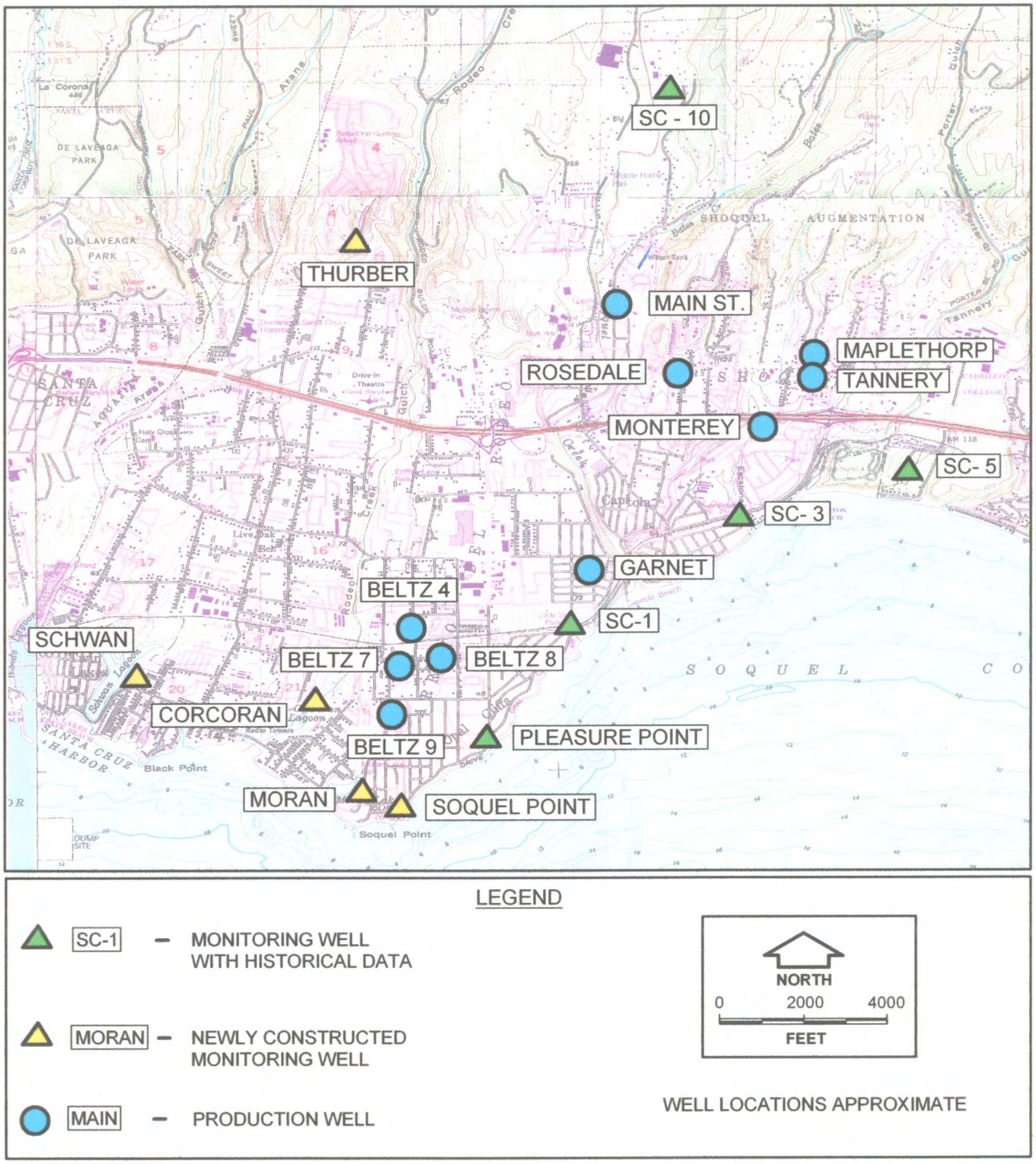
PLATES



STUDY AREA LOCATION MAP
IWP pEIR Preliminary Hydrogeological Study
City of Santa Cruz
Live Oak, California



WELL LOCATION MAP
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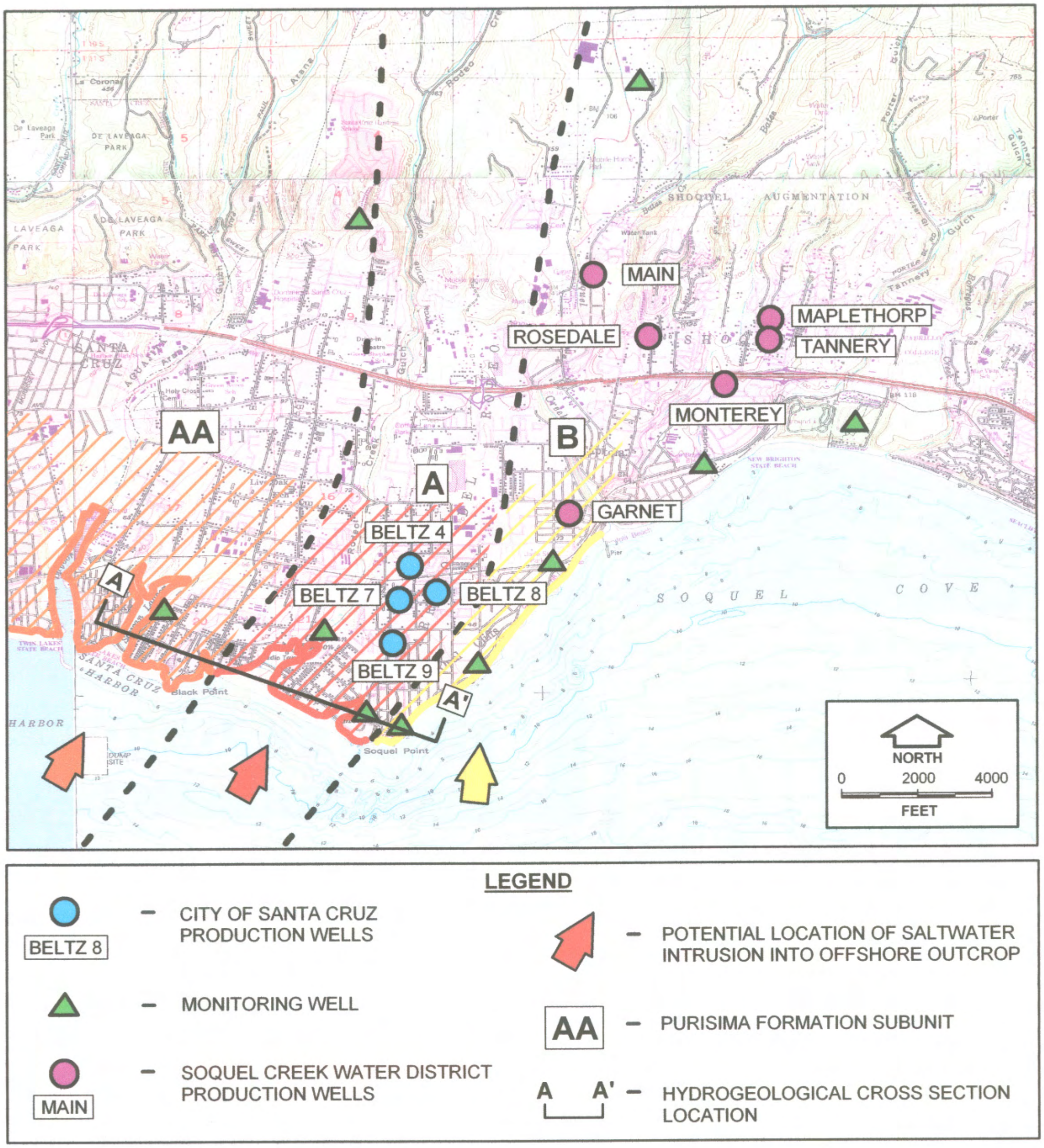
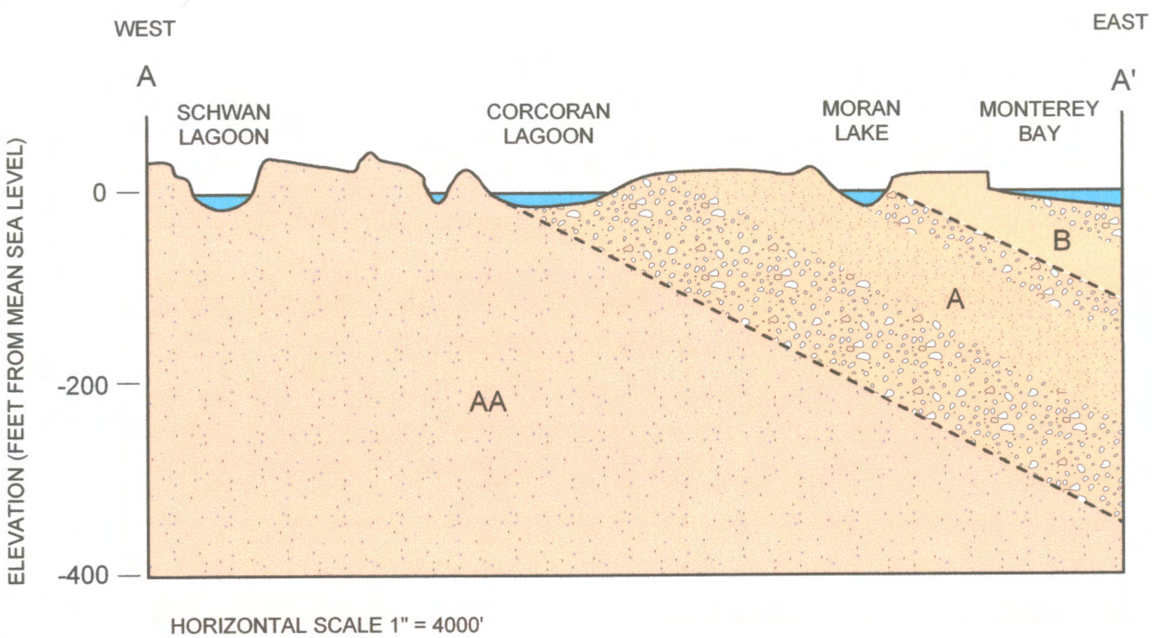
Live Oak, California



OUTCROP AREAS OF PURISIMA FORMATION SUBUNITS
IWP pEIR Preliminary Hydrogeological Study
City of Santa Cruz
Live Oak, California

HOPKINS
GROUNDWATER
CONSULTANTS



HYDROGEOLOGICAL CROSS-SECTION A-A'
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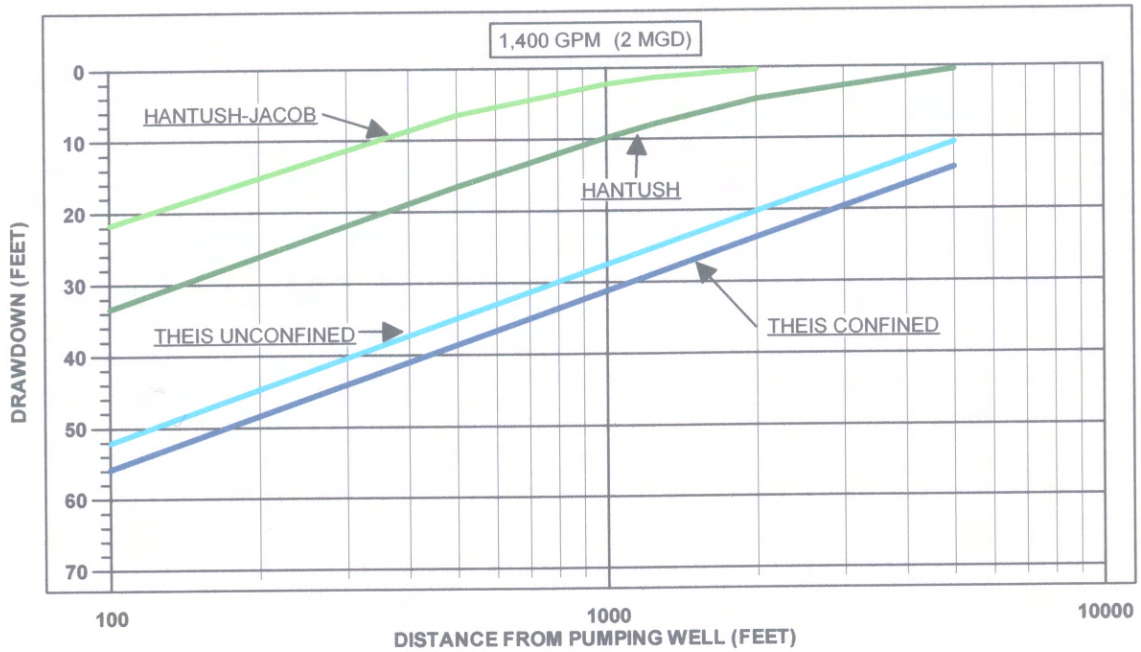
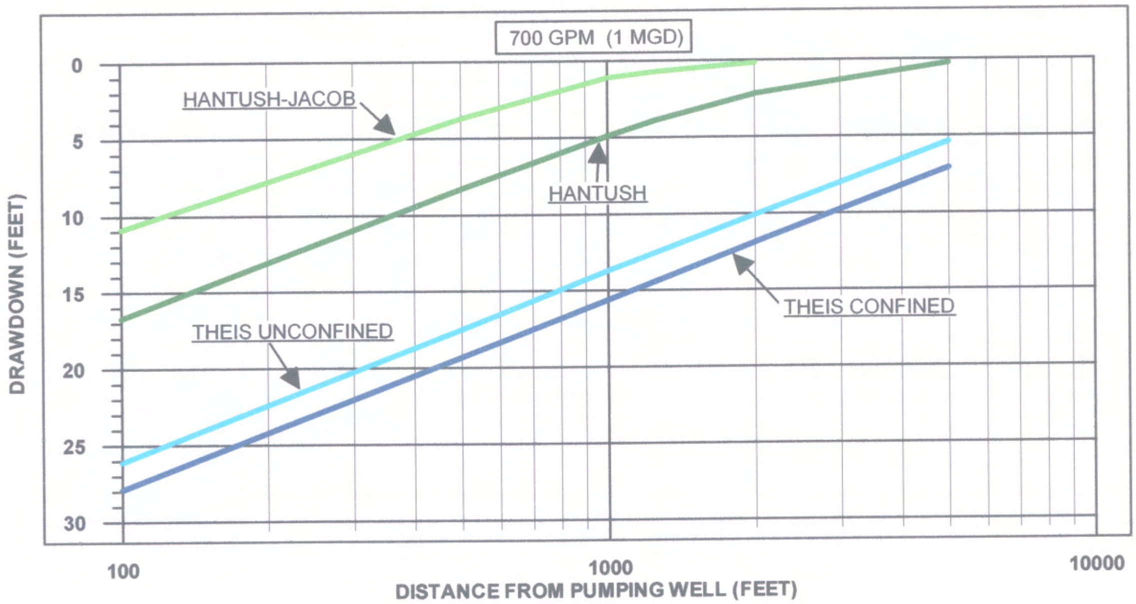
City of Santa Cruz
Live Oak, California

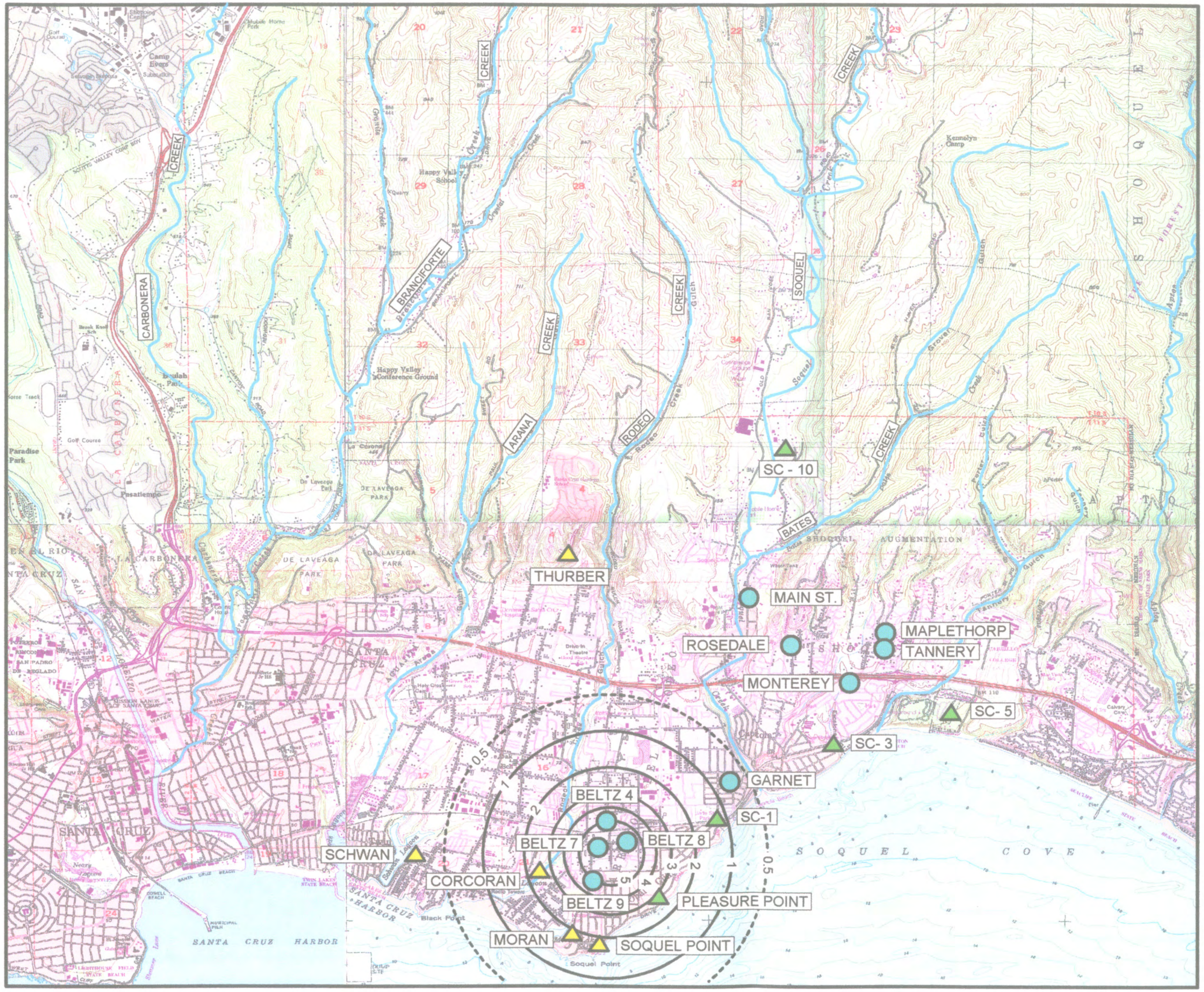
HOPKINS GROUNDWATER CONSULTANTS





AQUIFER PARAMETERS
FOR ALL GRAPH PROJECTIONS - T = 30,000 GAL/DAY/FT
HANTUSH-JACOB LEAKY - S = 0.005, 1/B = 0.0015 FT^{-1}, b = 90 FT
HANTUSH LEAKY - S = 0.005, B/r = 0.001 FT^{-1}, b = 90 FT
THEIS CONFINED - S = 0.005, b = 90 FT
THEIS UNCONFINED - S = 0.01, b = 160 FT

AQUIFER DRAWDOWN PROJECTIONS
IWP pEIR Preliminary Hydrogeological Study
City of Santa Cruz
Live Oak, California



LEGEND

- SC-1 – APPROXIMATE MONITORING WELL LOCATION WITH HISTORICAL DATA
- MORAN – APPROXIMATE LOCATION OF NEWLY CONSTRUCTED MONITORING WELL
- MAIN – APPROXIMATE PRODUCTION WELL LOCATION
- 3 – CONTOUR LINE OF PROJECTED WATER LEVEL DRAWDOWN IN FEET

NORTH

0 2000 4000

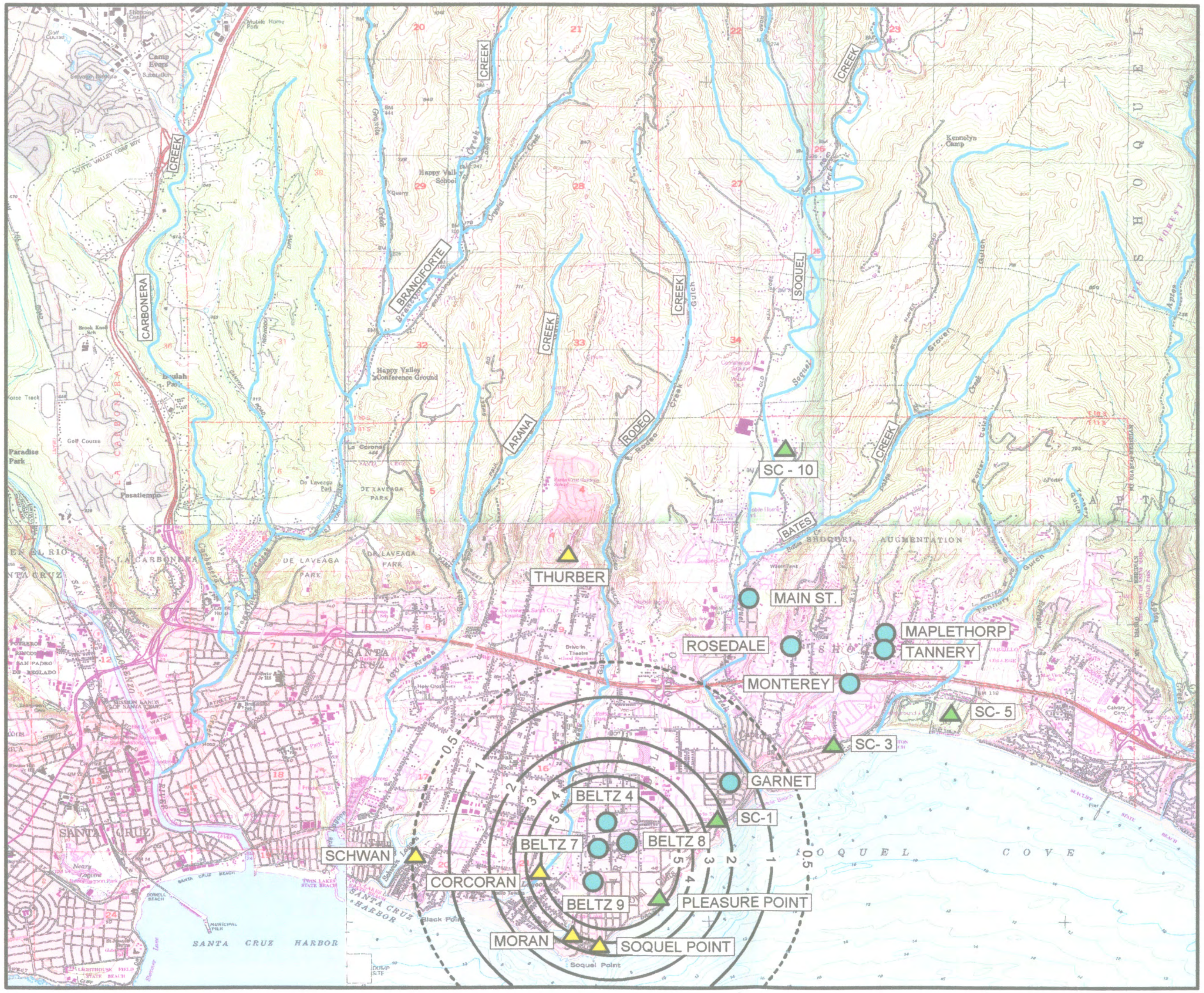
FEET

WATER LEVEL DRAWDOWN PROJECTIONS AT 1 MGD PRODUCTION

IWP pEIR Preliminary Hydrogeological Study

City of Santa Cruz
Live Oak, California

**HOPKINS
GROUNDWATER
CONSULTANTS**



LEGEND

SC-1 – APPROXIMATE MONITORING WELL LOCATION WITH HISTORICAL DATA

MORAN – APPROXIMATE LOCATION OF NEWLY CONSTRUCTED MONITORING WELL

MAIN – APPROXIMATE PRODUCTION WELL LOCATION

3 – CONTOUR LINE OF PROJECTED WATER LEVEL DRAWDOWN IN FEET

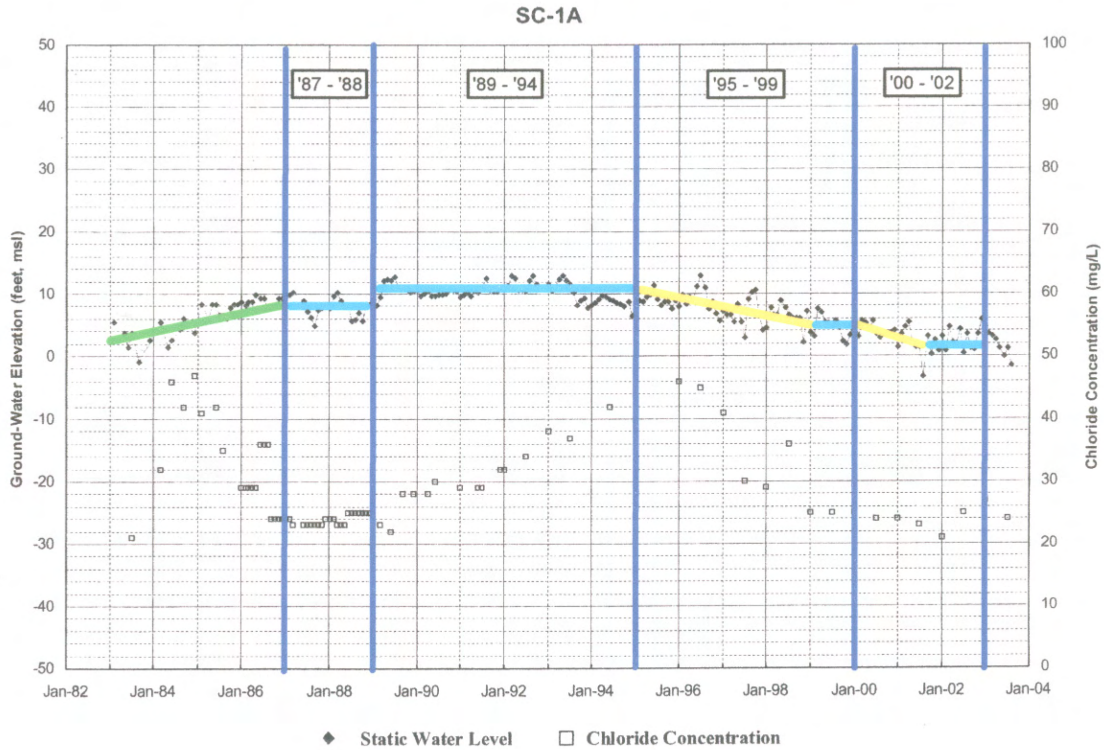
NORTH
0 2000 4000
FEET

WATER LEVEL DRAWDOWN PROJECTIONS AT 2 MGD PRODUCTION

IWP pEIR Preliminary Hydrogeological Study

City of Santa Cruz
Live Oak, California

APPENDIX A
CAPITOLA AND LIVE OAK AREA
GROUNDWATER HYDROGRAPHS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'89 - '94
'95 - '99
'00 - '02
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30
20
10
0
-10
-20
-30
-40
-50
100
90
80
70
60
50
40
30
20
10
0
Jan-82
Jan-84
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Jan-92
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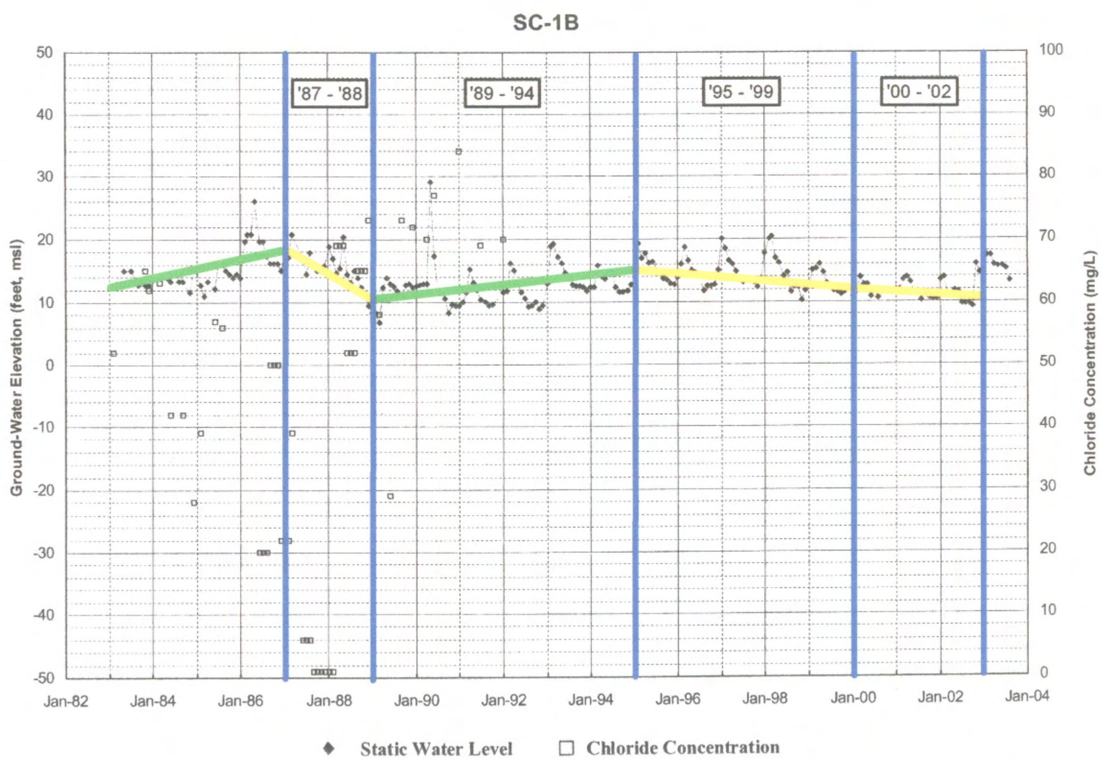
Jan-02
Jan-04
Static Water Level
Chloride Concentration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100
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80
70
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10
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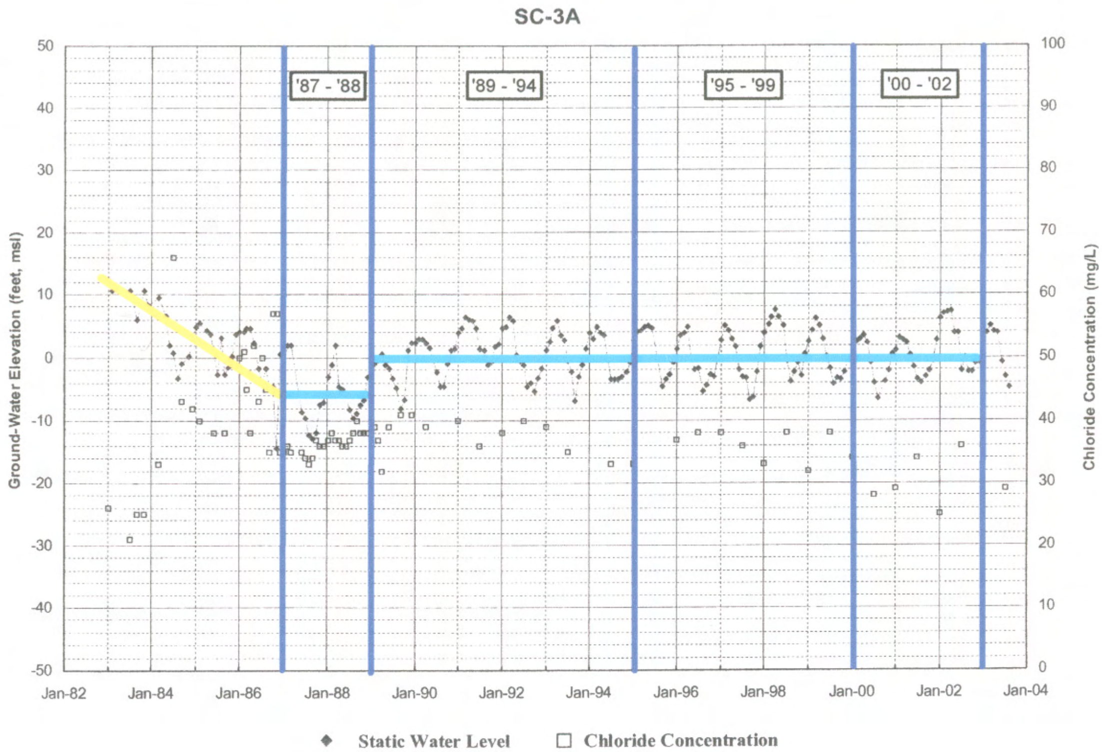
Jan-04
Static Water Level
Chloride Concentration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10
0
-10
-20
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-50
100
90
80
70
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0
Jan-82
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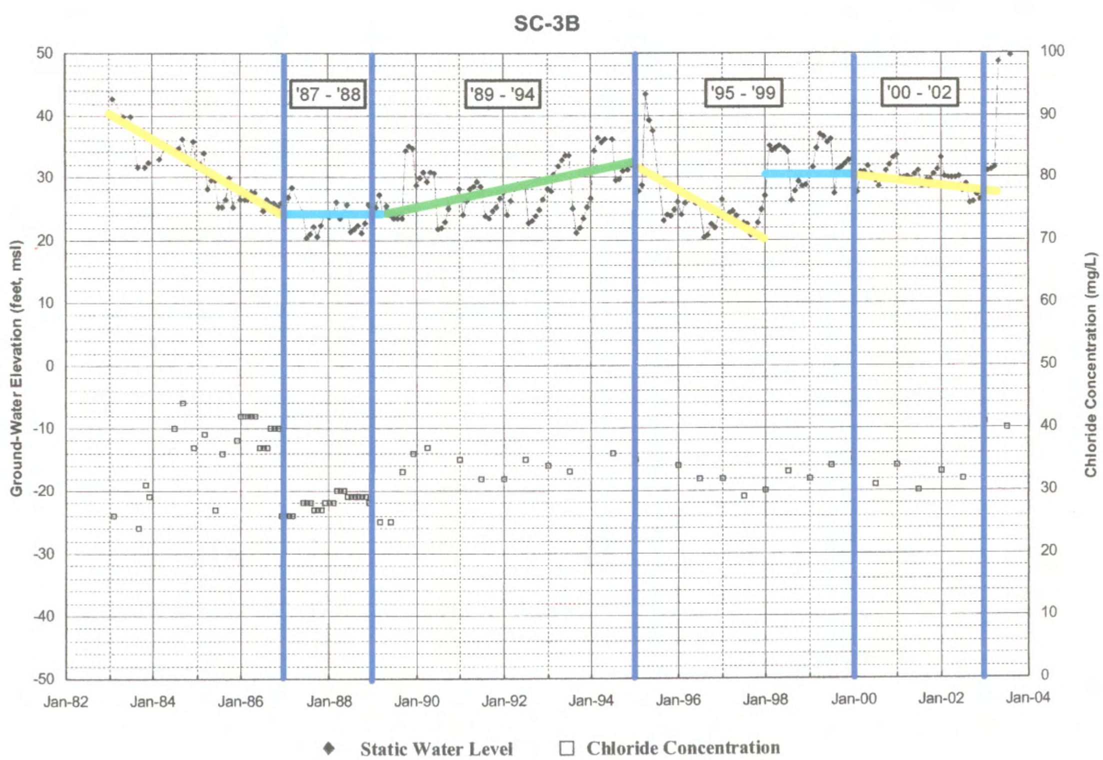
Jan-04
Static Water Level
Chloride Concentration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100
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80
70
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0
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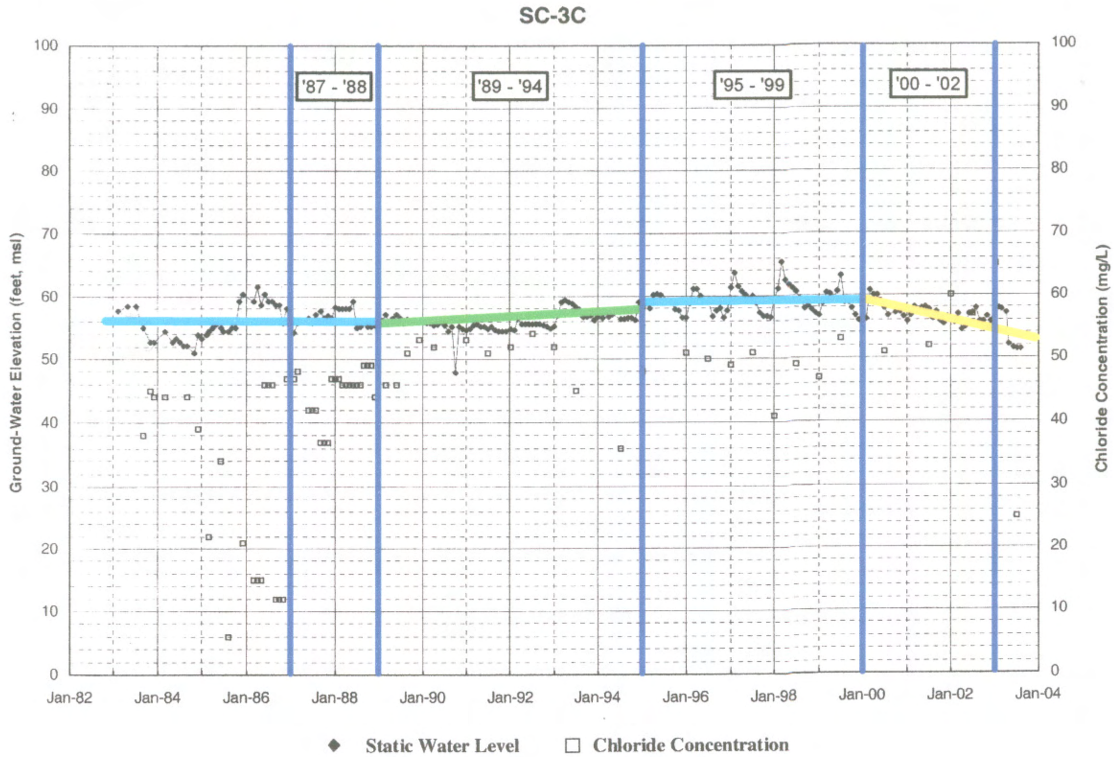
Static Water Level
Chloride Concentration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Chloride Concentration (mg/L)
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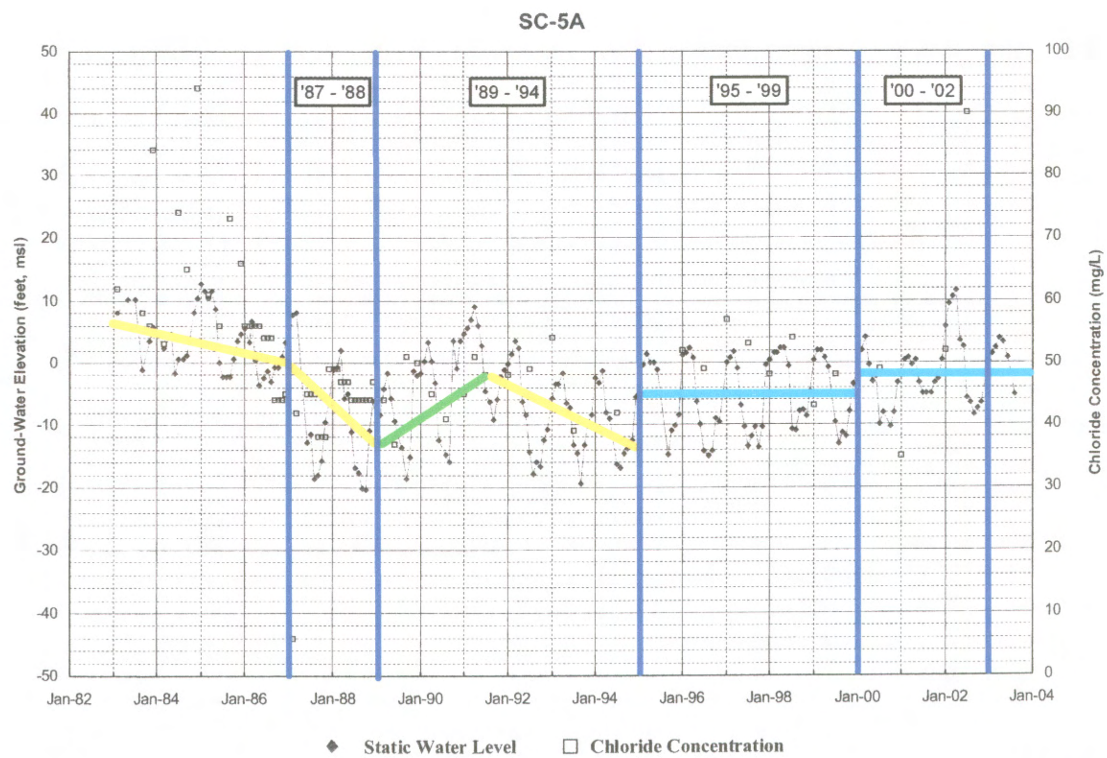
Jan-04
Static Water Level
Chloride Concentration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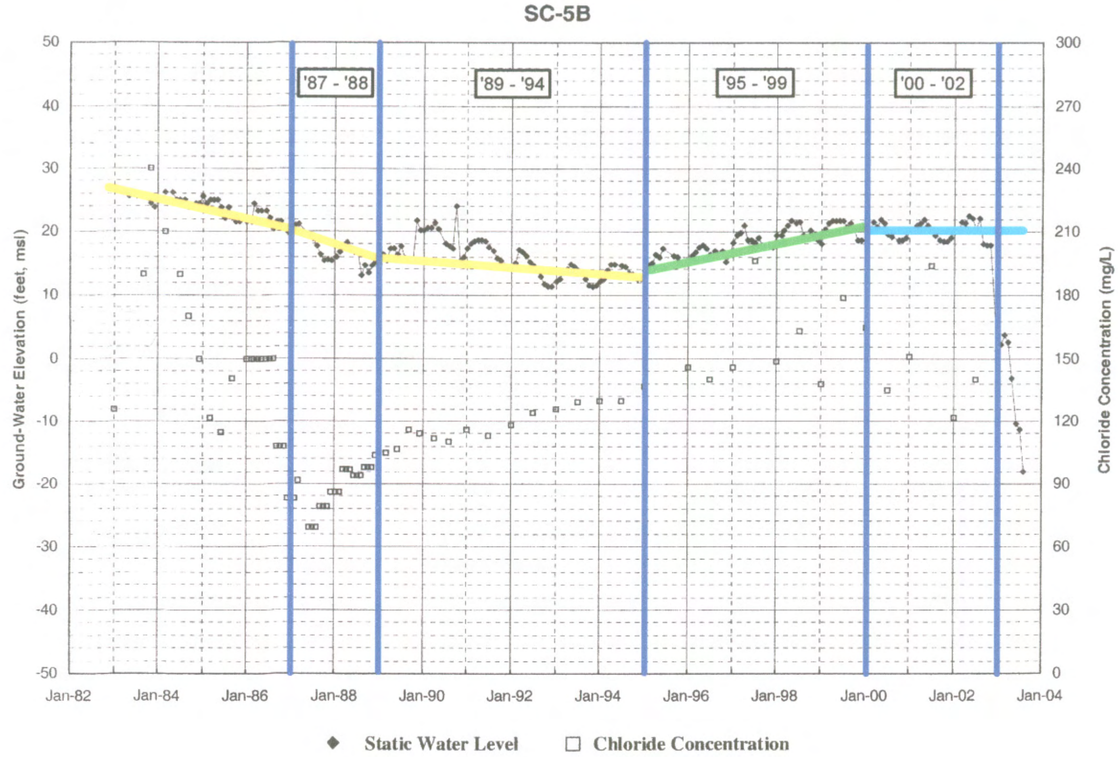
Static Water Level
Chloride Concentration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Jan-84
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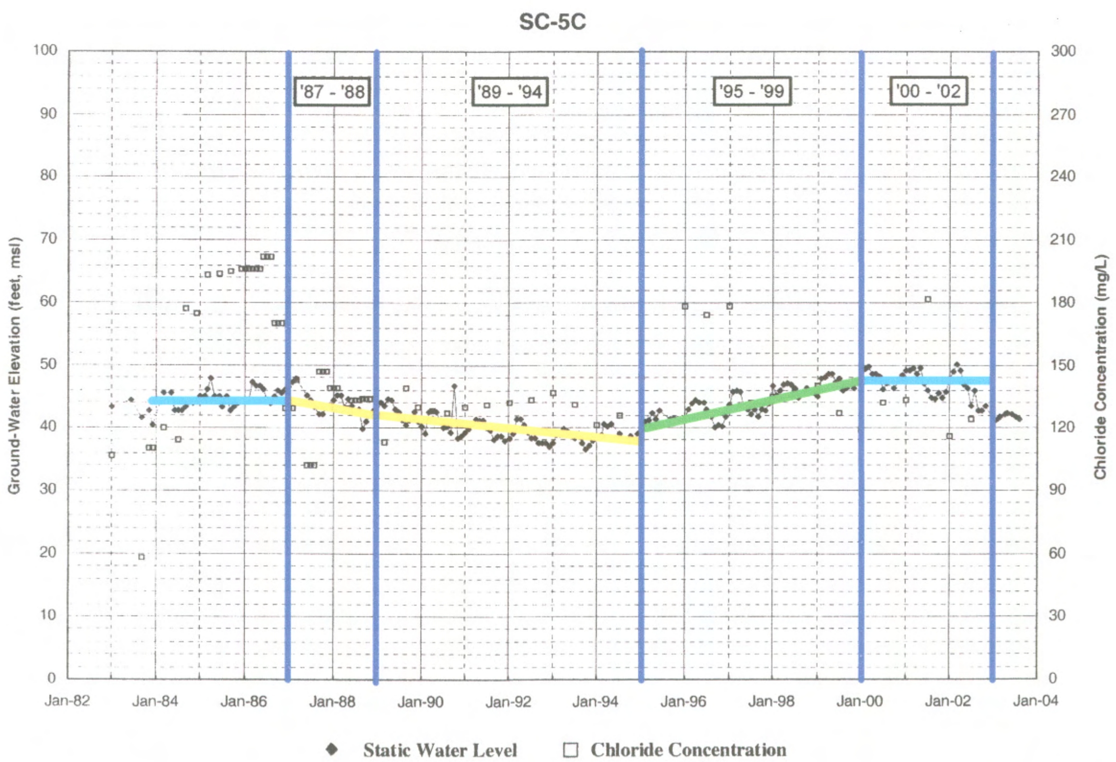
Jan-04
Static Water Level
Chloride Concentration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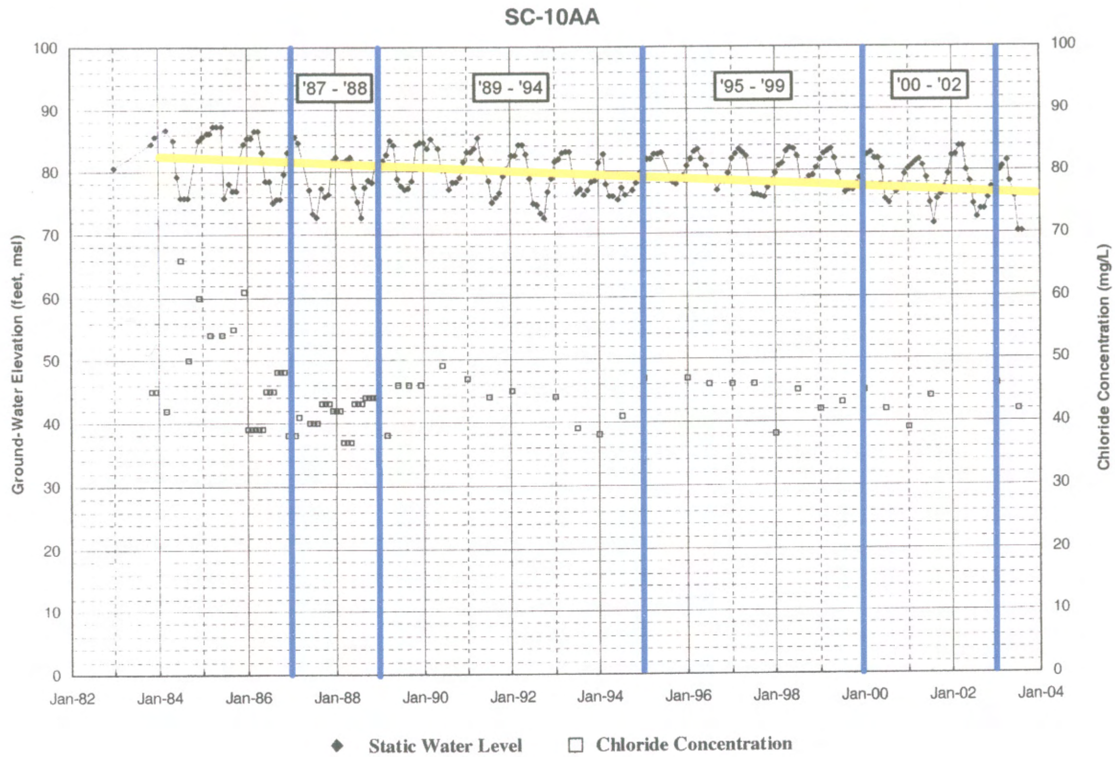
Jan-04
Static Water Level
Chloride Concentration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60
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80
90
100
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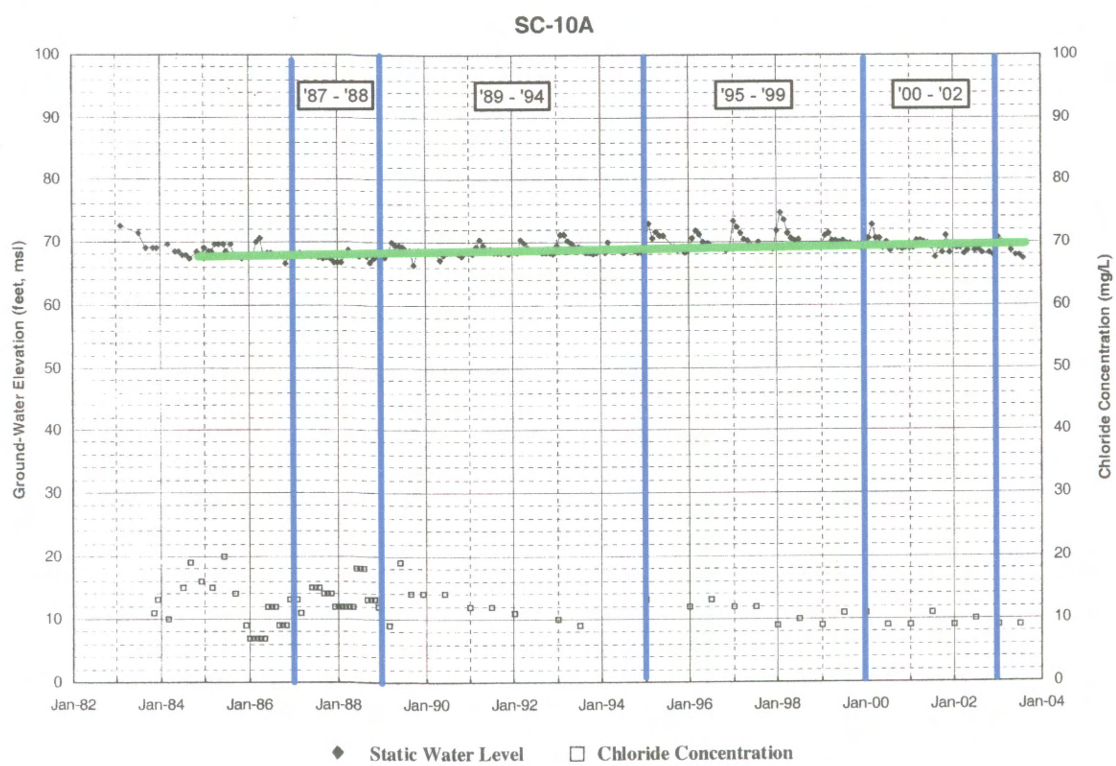
Jan-04
Static Water Level
Chloride Concentration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90
100
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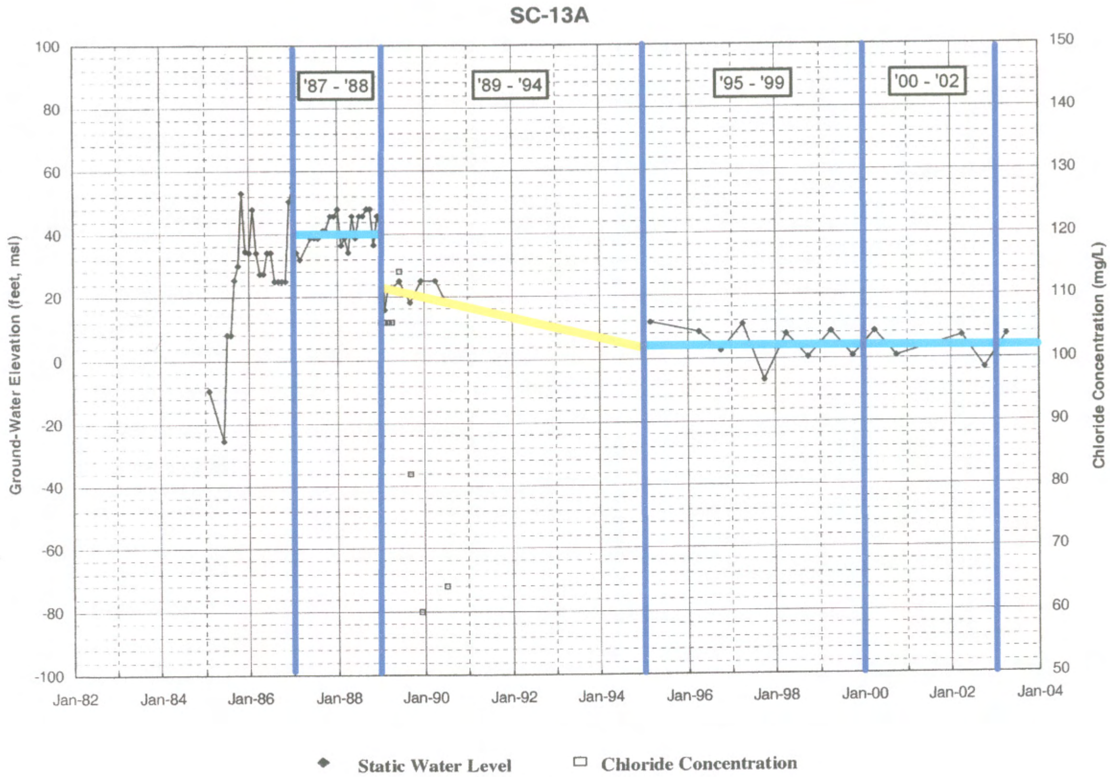
Jan-02
Jan-04
Static Water Level
Chloride Concentration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Ground-Water Elevation (feet, msl)
Chloride Concentration (mg/L)
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20
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-20
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-60
-80
-100
150
140
130
120
110
100
90
80
70
60
50
Jan-82
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Jan-96
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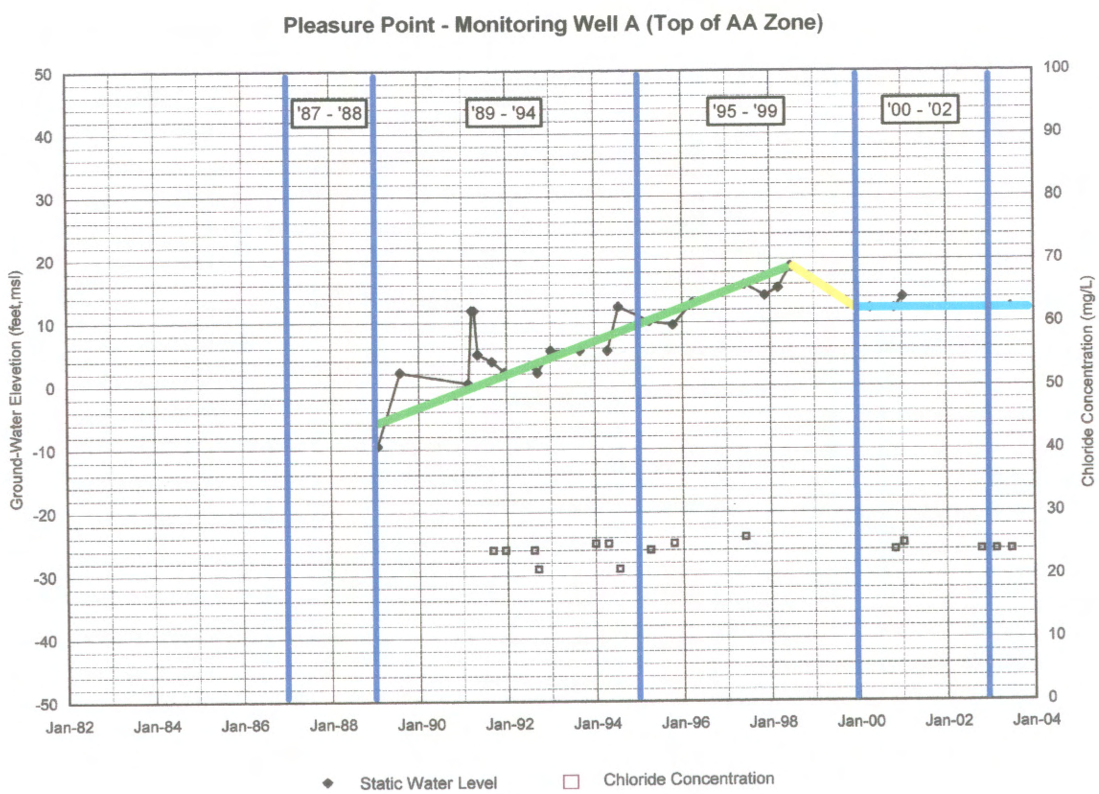
Jan-00
Jan-02
Jan-04
Static Water Level
Chloride Concentration


Pleasure Point - Monitoring Well A (Top of AA Zone)
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'00 - '02
Ground-Water Elevation (feet,msl)
Chloride Concentration (mg/L)
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100
90
80
70
60
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40
30
20
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0
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Jan-84
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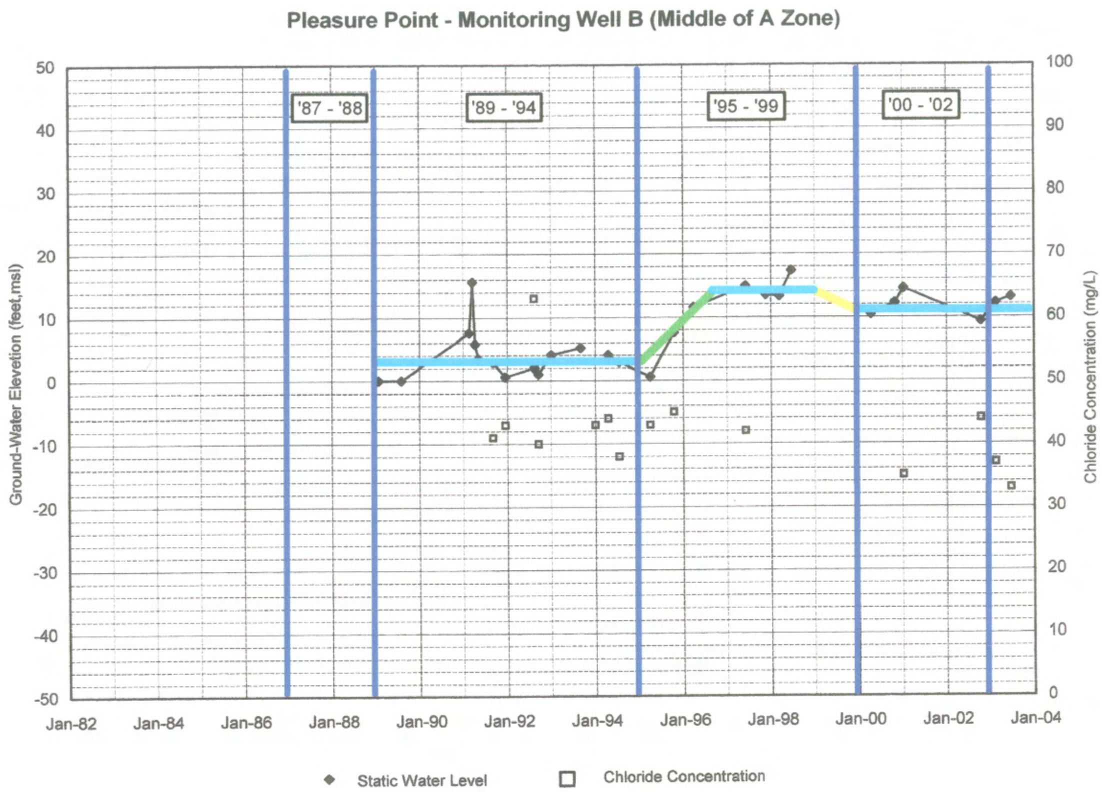
Jan-96
Jan-98
Jan-00
Jan-02
Jan-04
Static Water Level
Chloride Concentration


Pleasure Point - Monitoring Well B (Middle of A Zone)
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'00 - '02
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-50
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80
70
60
50
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30
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Jan-82
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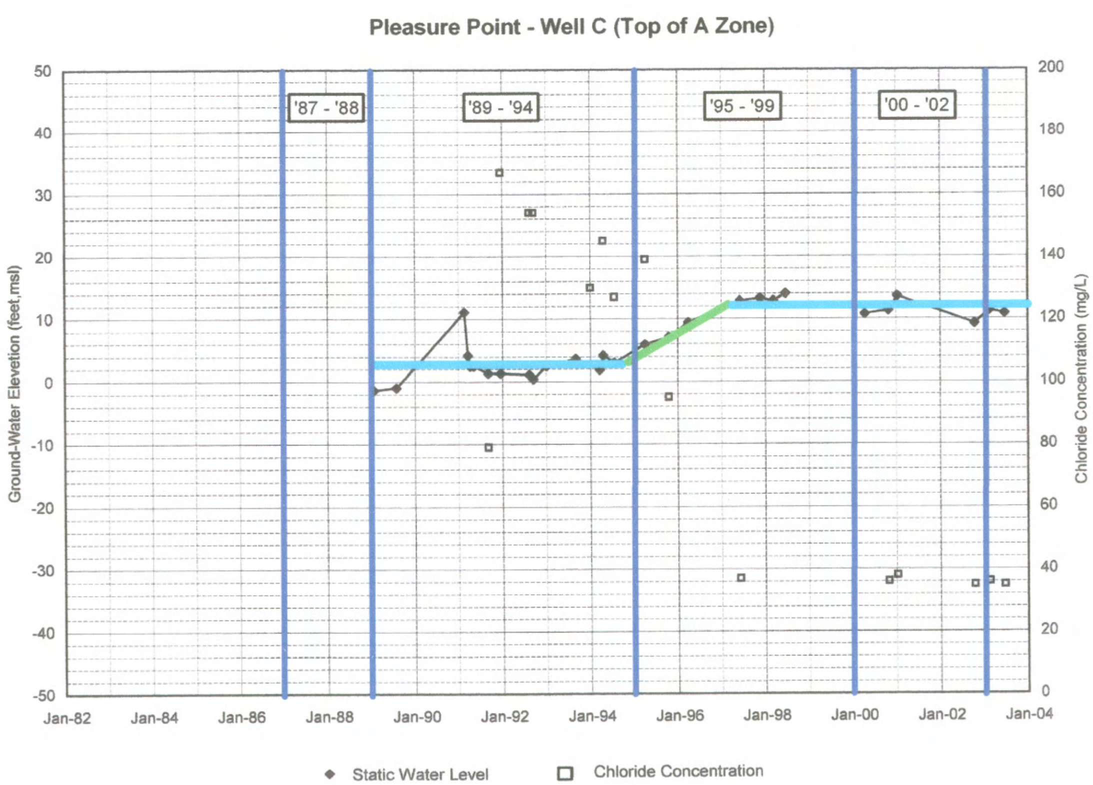
Jan-04
Static Water Level
Chloride Concentration


Pleasure Point - Well C (Top of A Zone)
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'00 - '02
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-20
-30
-40
-50
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180
160
140
120
100
80
60
40
20
0
Jan-82
Jan-84
Jan-86
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Jan-90
Jan-92
Jan-94
Jan-96
Jan-98
Jan-00
Jan-02
Jan-04
Static Water Level
Chloride Concentration