Section 8: Detailed Evaluation of Selected Alternatives

The previous section presented the recommended criteria to be used to evaluate CCSD's potential water supply alternatives. This section evaluates the alternatives outlined in Section 4. Each alternative was evaluated according to the established criteria.

8.1 Overview of Potential Water Supply Alternatives

Based on the water supply alternatives briefly described in Section 4, the following alternatives are evaluated in this section:

- Seawater Desalination
- Nacimiento Water Supply
- Whale Rock Exchange
- Hard Rock Drilling
- Recycled Water
- Demand Management
- San Simeon Dam and Reservoir- Van Gordon Site
- Jack Creek Dam and Reservoir

These alternatives are evaluated according to the following criteria:

- Water Supply Capabilities
- Water Quality
- Required Infrastructure
- Reliability
- Required Agreements/Institutional Issues
- Environmental Issues
- Permitting/CEQA

In the evaluation of these alternatives, it should be noted that the level of evaluation for each alternative differs significantly, both in the level of detail and the time at which the evaluation was performed. Accordingly, the ability to compare the alternatives is limited by the scope and age of previous studies.

8.2 Seawater Desalination

The Seawater Desalination alternative consists of constructing a subsurface seawater intake, pumping and pipeline facilities to transport the seawater to a desalination plant, a RO desalination treatment process, a groundwater blending system and pumping facilities to pump the treated water into the distribution system. Concentrate (waste brine) from the RO process would be conveyed in a separate pipeline back to a subsurface exfiltration gallery for disposal.

This alternative has been previously evaluated in the following studies:

- Boyle Engineering Corporation, "Economic Analysis of Alternative Water Resources Development," 1987.
- North Coast Engineering, Inc., "Cambria Community Services District Desalination Facility Project Description Report," 1994.
- Robert Bein, William Frost & Associates, "Final Environmental Impact Report Cambria Desalination Facility," 1994.
- Boyle Engineering Corporation, "Technical Specification for Cambria Community Services District Desalination Facility Reverse Osmosis Treatment System Equipment," 1995.
- Fugro West, "Geotechnical Engineering Report Cambria Desalination Project," 1996.
- Kennedy/Jenks Consultants, "Final Project Design Report: Desalination Project Management Services," 1998.
- Kennedy/Jenks Consultants, "Final Project Design Report: Desalination Project Management Services," 2000.
- Kennedy/Jenks Consultants, "Update of Cambria Desalination Project Costs," 2002.

Numerous variations of this alternative have been proposed, including:

- Supply Capabilities (300 gpm (300 AFY), 600 gpm (520 AFY), and 900 gpm (820 AFY))
- Intake Drilling Method (Slant-drilled and Directional-drilled)
- Pipeline Route (State Park Route and Highway Route)
- Addition of Nanofiltration
- Use of Solar Power

8.2.1 Water Supply Capabilities

Depending on the number of RO units chosen and the number of days of operation, this alternative could provide 300 gpm (300 AFY), 600 gpm (520 AFY), or 900 gpm (820 AFY) of RO permeate. Table 8-1 summarizes the operating assumptions for Seawater Desalination.

TABLE 8-1
OPERATING ASSUMPTIONS FOR SEAWATER DESALINATION

Number of 300 gpm RO units	Assumed Days of Operation	AFY produced	Projected Demand Scenario Met
1	226	300	None
2	195	520	None
3	206	820	3 and 4

As determined in Section 2, Seawater Desalination would meet projected demand for two of the build-out scenarios, with the 50 percent quality of life increase. It should be noted that if the days of operation were extended for any of the units, the AF produced would also increase. At a maximum, assuming 365 days of operation, the 300 gpm could produce 485 AF, the 600 gpm unit could produce 970 AF, and the 900 gpm unit could produce 1,455 AF. Accordingly, Seawater Desalination has the potential to meet the projected demands for all four scenarios with the 50 percent quality of life increase. However, due to the uncertainty in the number of days of actual operation, the production values given in Table 8-1 are assumed in the ranking.

8.2.2 Water Quality

For this alternative, the seawater must undergo pre- and post-treatment before it can be pumped into the distribution system. The pre- and post-treatment processes improve the system performance.

The pretreatment steps include natural sand filtration, cartridge filtration, the addition of sulfuric acid, and an anti-scalant. Each of these steps improves the overall water quality by improving the efficiency of the RO membrane. The addition of a nanofiltration unit would also remove hardness and multivalent ions from the water prior to the RO membrane, improving overall water quality by improving the efficiency of the RO membrane.

Post-treatment steps include disinfection, blending, and carbon dioxide stripping. DHS requires the disinfection system for this alternative to provide at least 0.5-log *Giardia* removal and 2-log virus removal. In order to reach these removal levels, sodium hypochlorite would be added to the RO permeate and the required contact time would be achieved using an efficient pipeline contactor. Once this requirement is met, the product water could be used directly or blended with groundwater.

Blending RO permeate with groundwater in a ratio of 2 RO: 1 Groundwater would improve the water quality of the RO permeate by reducing its corrosivity and improve the groundwater quality by reducing its hardness. Carbon dioxide stripping and the addition of caustic soda would be performed to increase the pH and further decrease the corrosivity of the blended water. After stripping the 2:1 blend could be blended with an additional 150 gpm of groundwater in the main distribution pipeline for an overall supply of 600 gpm of a 1:1 RO and groundwater blend. The blending of RO with groundwater allows for CCSD to achieve its water quality objectives of providing a water supply lower in hardness, sodium, and chloride. Table 8-2 provides a summary of the water quality before blending, after blending, and after carbon dioxide stripping.

TABLE 8-2
WATER QUALITY CHARACTERISTICS FOR SEAWATER DESALINATION

Constituent	RO Permeate	2:1 (RO:GW) Blend	Stripped 2:1 (RO:GW) Blend	1:1 (RO:GW) Blend
Flow rate (gpm)	300	450	450	600
Calcium (mg/l)	2	23.7	23.7	34.5
Magnesium (mg/l)	5	20	20	27.5
Sodium (mg/l)	150	111	111	91.5
Potassium (mg/l)	7	5.7	5.7	5
Total Alkalinity (mg/l as $CaCO_3$)	4.1	107.4	107.4	159
Chloride (mg/l)	245	175.3	175.3	140.5
Sulfate (mg/l)	10	32.3	32.3	43.5
Nitrate (mg/l)	-	3	3	4.5
Bromide (mg/l)	1.0	0.7	0.7	0.5
pH	5.50	6.62	7.92	7.08
Total dissolved solids, TDS (mg/l)	430±	440	440	440
Total Hardness, (mg/l as $CaCO_3$)	10	105	105	105
Dissolved Inorganic Carbon, DIC (mg/l)	8.5	40	26	45
Free carbon dioxide (mg/l)	27	52	2	27
Carbon dioxide removal (percent)	-	-	95	-
pH_S	10.31	7.82	7.82	7.49
Langelier Saturation Index ($pH – pH_S$)	-4.81	-1.20	+0.10	-0.41
Ryznar Saturation Index ($2pH_S – pH$)	15.21	9.02	7.72	7.90
NaOH addition to LSI > 0 (mg/l)	-	-	0	15
NaOH addition to RSI = 7.0 (mg/l)	-	-	4	21
NaOH addition to RSI = 6.5 (mg/l)	-	-	8	25

Source: Kennedy/Jenks Consultants. 2000. Final Project Design Report: Desalination Project Management Services.

8.2.3 Required Infrastructure

This alternative would require the construction of a horizontal well intake, exfiltration gallery, pipeline to the plant, pipeline for brine disposal, pumps, and a treatment facility including pre-, post- and RO treatment. Figure 4-1 provides a general layout of the proposed intake locations and pipeline routes. The well intake can be drilled by either of two methods: slant-drilling or directional-drilling. Table 8-3 provides a summary comparison of the drilling methods. Both drilling methods would require the following:

- Approximately 1,500 ft of pipeline extending from the vault to the ocean
- Approximately 650 ft of pipeline terminating directly offshore from the discharge point
- 10 ft of sand cover below 10 ft of seawater
- A 50 hp horizontal submersible pump
- 10-inch polyvinyl chloride (PVC) pump discharge pipe secured within a 18-inch carrier pipe
- An 18-foot by 10-foot by 10-foot buried concrete vault

The slant-drilled well would extend from the buried vault, located in the San Simeon State Park overflow parking lot east of Highway 1, and would consist of an exterior 24-inch steel casing pipe and an interior 18-inch high density polyethylene (HDPE) water transport pipe. The 24-inch steel casing pipe would be comprised of 200 ft of slotted stainless steel (SS 316) to allow for water intake and 1,275 ft of mild steel casing pipe. The interior corrosion resistant plastic pipeline would be approximately 200 ft of 18-inch PVC screen and 1,275 ft of 18-inch HDPE pipe. The intake is sized for a capacity of 1,500 gpm, required to yield 600 gpm of RO permeate.

The directional-drilled well would extend from a buried vault, located in the State Park parking lot site west of Highway 1, and would consist of 24-inch HDPE pipe. Instead of using a casing pipe a bentonite slurry solution would be used to support the hole. The pipeline would consist of approximately 240 ft of 12-inch by 10-inch PVC pre-packed screen attached to approximately 1,260 ft of 24-inch HDPE pipe.

TABLE 8-3
DRILLING METHODS SUMMARY FOR SEAWATER DESALINATION

Drilling Method	Vault Location	Hole Support	Intake pipe		Pre-Packed Screen	
			Size	Length	Size	Length
Slant	East of Hwy 1	24-inch steel casing pipe	18-in HDPE	1,275 ft	18-in PVC	200 ft
Directional	West of Hwy 1	Bentonite slurry	24-in HDPE	1,260 ft	10-in PVC	240 ft

The concentrate discharge system would consist of two 8-inch perforated PVC pipes extending in opposite directions and joined at a concrete splitter box. This subsurface exfiltration gallery would be located on the beach approximately 2 ft above the high sea level with a drainage area of 360 square feet. The engineered gravel gallery encased in filter fabric would be 2 ft wide by 2 ft deep located 6 ft below existing grade. It would extend 100 ft in opposite directions parallel to the coastline for a total perforated pipe length of 200 ft. The trench would be lined with a heavyweight non-woven filter fabric with 3/4-inch clean washed aggregate filling the void between the perforated pipe and lining. Approximately 6 ft of sand would cover the filter fabric. The 8-inch perforated PVC pipe would contain four rows of 1/4-inch diameter holes.

Two pipeline route alternatives have been proposed: the State Park Route and the Highway Route. Both pipeline routes would consist of parallel intake and brine pipelines. The intake pipe would be a 10-inch PVC pipe extending 3,200 ft in length for either pipeline route. The brine concentrate discharge pipe would be 8-inch PVC pipe also extending approximately 3,200 ft in length.

The State Park Route commences at the overflow parking lot at a location near the convergence of the intake and discharge facilities. After crossing the timber bridge, the pipelines continue along an existing utility corridor under a driveway to an intersection with the roadway leading up to the Washburn campground area. At this location, CCSD maintains an existing footbridge over San Simeon Creek. The two pipelines would be attached to this bridge either underneath the existing bridge structure, or by attaching to the sides of the bridge, depending on the results of a structural analysis. After crossing the pedestrian bridge, the pipelines would enter existing CCSD property and would head easterly along an existing utility corridor, crossing Van Gordon

Creek and arriving at the Desalination Facility. The crossing of Van Gordon Creek would most likely be accomplished by an underground concrete encasement.

The Highway Route starts east of Highway 1. The pipelines were originally proposed to be constructed within the existing California Department of Transportation (CalTRANS) Highway 1 right-of-way in the easterly shoulder area of the highway. However, recent changes to CalTRANS policy requires that the pipeline route be modified outside of the existing CalTRANS right-of-way. Approximately 1,000 ft north of the parking lot site is an approximately 450-foot long concrete slab bridge over San Simeon Creek. Crossing the creek at this location would require hanging the pipelines on the easterly edge of the bridge, and would likely involve the reconstruction of abutment ends. The pipelines would then proceed northerly along Highway 1 to the intersection of San Simeon Creek Road. The pipeline would follow the alignment of San Simeon Creek Road. The pipelines would be located on the shoulder of San Simeon Creek Road where possible, but a significant portion would be constructed within the roadway, requiring significant pavement replacement and traffic control. Proceeding easterly along San Simeon Creek Road, the pipelines would arrive at the existing percolation pond site and would terminate at the Desalination Facility.

The Desalination Facility would consist of a 300 gpm train with 40 percent recovery, for the 300 gpm RO unit. The 600 gpm RO system would include a second 300 gpm RO train, additional cartridge filters and distribution pumps to accommodate the increased flow rate. The 900 gpm RO system would include a larger intake system, a larger building for the additional RO capacity, additional pre-treatment and post-treatment facilities and distribution pumps to accommodate the increased flow rate.

High efficiency positive displacement RO feed pumps and a pressure exchanger energy recovery device would also be required for the Desalination Facility. A plant supervisory control and data acquisition (SCADA) system including an overall plant process Programmable Logic Controller (PLC), supervisory computer, the associated signal and control wiring, and basic control software would also be required.

If nanofiltration (NF) is incorporated, a 60 percent recovery could be achieved. With this increase in recovery, the intake flows could be reduced and the intake pipeline could be reduced to 8-inch from 10-inch. However, the building size required would increase to provide space for the NF unit. NF is considered more complicated to use and operate than a RO system and would also require more energy. However, a NF-RO system would allow CCSD to also utilize the desalination facility for centralized water softening as discussed in Section 5.4.3. The addition of a nanofiltration unit did not provide CCSD with immediate O&M savings and thus is not considered further in this report. However, CCSD customers would benefit from savings in water softening, reduction in the purchase of bottled water, and reduction in fixtures replacement should it be incorporated.

A carbon dioxide stripping tower with wet well, two 450 gpm distribution pumps, and pipeline extending to existing distribution pipeline would be required after the RO unit for post-treatment. The disinfection system would include 75 linear ft of 36-inch diameter pipeline. The disinfection contactor pipeline would have a 25 to 1 length to diameter ratio and would be considered to provide the required 0.5-log *Giardia* inactivation and approximately 8-log virus inactivation. A sodium hypochlorite chemical feed system and storage tank would also be required.

The solar power system would consist of ground mounted photovoltaic (PV) solar panels and the associated electrical equipment to connect to the local power grid. A single-axis ground mounted PV solar electric system maximizes the energy generated by tracking the sun on a tilted axis from east to west so that full sunlight exposure is assured. The result is that a more consistent flow of energy is produced. The placement of the PV panels is critical to the energy production; to maximize the power generated by the panels a feasibility study would need to be conducted. An additional 6,200 square feet would be required for the solar power system.

8.2.4 Reliability

Seawater is considered to be a very reliable source, because it is neither affected by drought nor dependent upon the season for its availability. Accordingly, this alternative is dependent upon the reliability of the infrastructure.

The slant-drilled intake appears to cross a suspected fault line whereas the directional-drilled intake alignment does not. Further study would need to be conducted to ensure structure stability before design and construction could begin. Additionally, CCSD should consider further geological exploration of the alluvial deposit at the San Simeon Creek beach area. Although found to be relatively deep from past geophysical studies, drilling never occurred in the area and is needed in order to assess the feasibility for a beach well. A beach well could prove to be more reliable than either of the approaches proposed in the 2000 report.

In increase in reliability could also be achieved by increasing the size of the facility. For example, if the 900 gpm option were selected, the Seawater Desalination alternative has the potential to provide nearly sufficient redundancy to meet the max day demand (1,091 gpm) for Scenario 4, assuming 1.66 persons per dwelling unit.

8.2.5 Required Agreements/Institutional Issues

Because this alternative involves construction within the San Simeon State Park and the ocean, there are a number of important agreements that must be obtained.

SLO County approval and CCC concurrence would be required for this alternative.

The State Park pipeline route would require right-of-way agreements with the Department of Parks and Recreation for construction of the pipeline through the park. Historically, the State Park has been hesitant to yield right-of-way. Right-of-way for the Highway Route alternative would need to be obtained from CalTRANS. An encroachment permit for CalTRANS is not anticipated to be difficult to obtain.

CCSD already owns property adjacent to the proposed Desalination Facility that could accommodate future solar panels, but an agreement with Pacific Gas & Electric (PG&E) for the solar power credit would need to be obtained.

8.2.6 Environmental Issues

This alternative has numerous environmental concerns associated with it because the proposed pipeline crosses through San Simeon State Park and involves several stream crossings and the construction of infrastructure in coastal areas. In 1994, Robert Bein, William Frost & Associates

(RBF) prepared a Final Environmental Impact Report (EIR) for a previously proposed desalination project. Although changes have since been made to the design of this alternative, the environmental issues identified in the EIR are expected to be similar.

The intake pipeline, for the directional-drilling method, would cross a tributary to San Simeon Creek utilizing a timber bridge with a concrete deck. In conversations with Mr. Greg Smith of the State Parks Department, it is apparent that this bridge is home to sparrows and is a known Red-Legged Frog habitat area, requiring that careful measures be taken for construction. For the purpose of this analysis, it is assumed that the creek crossing would be accomplished by the construction of a pipe bridge structure running parallel to the existing timber bridge.

The State Park Route passes almost entirely through the State Park and thus has a greater potential for impacting habitat than the Highway Route. Revegetation and other mitigation should be used to minimize habitat disruption. The American Badger, Red-Legged Frog and Southwestern Pond Turtle, must be relocated if found near the treatment facility site before construction, as stated as a mitigation measure in the Final EIR.

The intake structure would have short-term and long-term impact on sandy bottom habitat, kelp beds, and the reef system. Restoration of these areas after construction as well as monitoring for future impacts may be required. Location of the intake was selected to minimize these impacts. Salinity monitoring at the concentrate discharge system would also be required to determine the impact on marine organisms. The addition of an NF unit would produce more concentrated brine, which could have more impacts on marine life at the effluent discharge point than if only an RO membrane is used due to the more concentrated discharge. However, the concentrate discharge system would be designed to allow for better mixing and dilution to minimize environmental impacts.

To minimize negative visual impacts, the Desalination Facility would be constructed to look like an agricultural building with silo in order to appear less conspicuous.

Another major environmental concern identified in the Final EIR is the impact of the pumps on air quality and energy consumption. Both of these impacts could be mitigated with the addition of a solar power system.

8.2.7 Permitting/CEQA

As a result of construction of this alternative occurring within San Simeon State Park and near the ocean, there are several permits, which would need to be obtained. Table 8-4 provides a complete list of the required permits as updated from the Final EIR.

A National Pollutant Discharge Elimination System (NPDES) permit for the discharge of the concentrate into the ocean would be required from the Regional Water Quality Control Board (RWQCB). The RO permeate (or Groundwater Blend) would require a Domestic Water permit to ensure the treated water meets regulations as outlined in the Safe Drinking Water Act. The Highway Route crosses known archeological sites existing in the area and would require the appropriate CEQA analysis and mitigation. Of particular concern is the Coastal Development Permit from the CCC, which may be difficult to obtain.

In addition to the required permits, an updated EIR and additional CEQA/NEPA documentation would be required because substantial changes have been made to the alternative since completion of the Final EIR in 1994.

TABLE 8-4
LIST OF REQUIRED PERMITS FOR SEAWATER DESALINATION

Agency	Permit Description	Permit Jurisdiction
Local Permits		
County of SLO, Public Works	Encroachment Permits	Required for work within County road right-of-way
County of SLO, Building and Planning Department	Land Use Permit	Required for changes in land use
County SLO, Building and Planning Department	Coastal Development Permit Building and Grading Permits	Required for on-shore development; grading activities
State Permits		
California Regional Water Quality Control Board	National Pollutant Discharge Elimination System Permit (NPDES)	Required for brine discharge
California Regional Water Quality Control Board	Storm Water NPDES	Required for construction activities; storm water discharge
California Department of Transportation	Encroachment Permit Transportation Permit	Required for work crossing highway; transportation of oversize loads
Department of Health Services	Domestic Water Permit	Required to ensure safe water quality
California Department of Parks and Recreation	Special Use Permit, Land Lease for Pipelines	Required for encroachment on State Park land
CalOSHA	Trenching and Excavation Permit	Any portion of project requiring trenching/excavation greater than 5 ft deep
California Coastal Commission	Coastal Development Permit	Required for intake/discharge structures
Federal Permits		
U.S. Army Corps of Engineers	Section 404	Required for projects affecting wetlands, inland waters, lakes, rivers, etc.
U.S. Fish and Wildlife	Fish and Wildlife Coordination Act Section 10 (a) Permit Endangered Species Act	Required for stream crossings; conservation of endangered species
State Historic Preservation Office	Section 106 Review	National Historic Preservation Act of 1966

Source: Robert Bein, William Frost & Associates. 1994. Final Environmental Impact Report Cambria Desalination Facility.

8.2.8 Cost

Table 8-5 provides a summary of the estimated capital costs associated with the options within the Seawater Desalination alternative. The intake/discharge cost includes the subsurface intake, pump, vault, exfiltration gallery, and intake and discharge pipelines. The cost of the intake structure is similar regardless of the drilling method selected. The pre- and post-treatment costs include cartridge filters, stripping tower, and the disinfection contactor. The RO facility cost includes the cost for the RO membrane units, controls, cleaning, pumps, pipeline, site work, building, and electrical instrumentation.

TABLE 8-5
ESTIMATED CAPITAL COST (2002) FOR SEAWATER DESALINATION

Major Alternative Component	300 gpm RO	600 gpm RO	900 gpm RO
Water Production	300 AFY	520 AFY	820 AFY
Intake/Discharge	$3,134,000	$3,185,000	$4,108,000
Pre-/Post- Treatment	$548,000	$588,000	$751,000
RO Facility	$3,489,000	$4,853,000	$6,258,000
Subtotal	$7,171,000	$8,626,000	$11,117,000
Contingency[(a)]	$1,076,000	$1,294,000	$1,668,000
Total	$8,247,000	$9,920,000	$12,785,000

Note: (a) Evaluated at 15 percent.

Fixed annual and variable O&M costs for this alternative are provided in Table 8-6.

TABLE 8-6
ESTIMATED O&M COST (2002) FOR SEAWATER DESALINATION

Major Alternative Component	300 gpm RO	600 gpm RO	900 gpm RO
Fixed O&M Costs:			
Labor[(b)]	$71,000	$71,000	$71,000
Membrane Replacement[(d)]	$14,000	$27,000	$41,000
Maintenance Costs [(a)]	$22,000	$34,000	$45,000
Total ($/Yr)	$107,000	$132,000	$157,000
Variable O&M Costs:			
Power[(c)]	$650	$621	$614
Chemicals[(a)]	$32	$33	$30
Monitoring Requirements[(a)]	$113	$57	$38
Total ($/AF)	$795	$711	$682

Notes:
(a) Based on similar costs for the 300 gpm Marina Seawater Desalination Facility in Marina, California.
(b) Estimated for one full-time operator at $34/hr (which includes overhead and benefits) for 8 hours per day and 260 days per year.
(c) Energy costs were estimated at $0.15 kW-hr. Includes the power cost for pumping the intake pump (80 percent pump and 90 percent motor efficiency), RO feed pumps (90 percent pump and 94 percent motor efficiency), booster pump (75 percent pump and 92 percent motor efficiency), and distribution system pumps (80 percent pump and 90 percent motor efficiency).
(d) Estimated at $700 per membrane and a life of 7 years.

Table 8-7 provides a summary of the fixed and variable costs for Seawater Desalination. Annualized capital cost was estimated using a 4 percent interest rate and a 30-year life span.

TABLE 8-7
COST SUMMARY (2002) FOR SEAWATER DESALINATION

Water Production	Capital Costs	Annual Capital Cost[a]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)[b]
300 gpm	$8,247,000	$477,000	$107,000	$584,000	$800
600 gpm	$9,920,000	$574,000	$132,000	$706,000	$710
900 gpm	$12,785,000	$739,000	$157,000	$896,000	$680

Notes:
(a) Calculated using 4 percent interest rate, 30-year life span.
(b) Rounded to nearest $10/AF.

State and federal funding may be available for desalination. The Water Resources Development Act (WRDA) authorizes Federal cost sharing for water supply projects. Up to 75 percent of capital costs (up to $10 million) may be appropriated by Congress for authorized projects. CCSD received project authorization under the WRDA during 2001. Currently, the U.S. ACE and CCSD are developing initial WRDA project tasks. This funding would provide a significant cost reduction per acre-foot, allowing any of the options to be cost-effective. Table 8-8 provides a summary of the fixed and variable costs for Seawater Desalination with the 75 percent reduction in capital cost from grant funding included.

TABLE 8-8
COST SUMMARY (2002) WITH GRANT FUNDING FOR SEAWATER DESALINATION

Water Production	Capital Costs	Annual Capital Cost[a]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)
300 gpm	$2,062,000	$119,000	$107,000	$226,000	$800
600 gpm	$2,480,000	$143,000	$132,000	$275,000	$710
900 gpm	$5,285,000	$305,000	$157,000	$462,000	$680

Note: (a) Calculated using 4 percent interest rate, 30-year life span.

Funding would also be available if a solar power system was installed. The PG&E "Self-Generation Incentive Program" would provide payments of up to $4,500 per installed kilowatt or 50 percent of a solar power system costs (whichever results in a lower cost). The maximum size of a system that would be funded under this program is one mega Watt. There is also a limit of twice the maximum system power demand for the installed solar power system. For example, because the estimated demand for the 300 gpm RO plant is 240 kilowatts (kW), the largest solar power system that could be installed under the PG&E program is 480 kW.

Because energy costs comprise approximately 60 to 70 percent of the operating costs of a RO system, the use of solar power lowers operating costs and stabilizes long-term costs from future power cost fluctuations.

"Net metering" allows for the solar power system to generate electricity back into the PG&E power grid when the Desalination Facility is not in operation. Any excess power is credited to

CCSD on an annual basis to offset power use when demands exceed the output of the solar power system. Earlier net metering arrangements were limited to a 10 kW maximum. However, a recent decision by the California Public Utilities Commission (CPUC) increased this maximum ceiling to 1 megawatt (CPUC decision 02-03-057). When the Desalination Facility is operating, the solar system would supply power to the Desalination Facility. During the night, electricity from PG&E would supply power to the Desalination Facility.

For estimating purposes, a conceptual cost estimate was obtained from a large manufacturer and installer of solar power systems (Powerlight) for turnkey design, installation, and grid interconnection for 200 kW PowerTracker PV system. The estimated turnkey cost is $1.92 million. Accordingly, the projected capital cost for 480 kW system would be $4.6 million or $2.4 million with the PG&E funding. Tables 8-9 and 8-10 provide a summary of the costs for this alternative with the addition of a solar power system with and without funding. The Desalination Facility capital cost includes the WRDA grant funding and the solar power system capital cost includes the PG&E funding. The solar power system may also be eligible for WRDA funding.

TABLE 8-9
SOLAR POWER OPTION COST SUMMARY (2002) WITHOUT GRANT FUNDING FOR SEAWATER DESALINATION

Water Production	RO Facility Capital Cost	Solar Power Capital Cost	Total Annual Capital Cost[(a)]	Fixed O&M Cost	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)
300 gpm	$8,247,000	$4,600,000	$743,000	$130,000	$872,000	$260
600 gpm	$9,920,000	$8,800,000	$1,083,000	$176,000	$1,258,000	$110
900 gpm	$12,785,000	$13,000,000	$1,491,000	$216,000	$1,707,000	$120

Note: (a) Calculated using 4 percent interest rate, 30-year life span.

TABLE 8-10
SOLAR POWER OPTION COST SUMMARY (2002) WITH GRANT FUNDING FOR SEAWATER DESALINATION

Water Production	RO Facility Capital Cost	Solar Power Capital Cost	Total Annual Capital Cost[(a)]	Fixed O&M Cost	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)
300 gpm	$2,062,000	$2,400,000	$258,000	$130,000	$388,000	$260
600 gpm	$2,480,000	$4,700,000	$415,000	$176,000	$591,000	$110
900 gpm	$3,196,000	$8,500,000	$797,000	$216,000	$1,013,000	$120

Note: (a) Calculated using 4 percent interest rate, 30-year life span.

The annual fixed costs were higher for a system with solar power then for a system without solar power, but the variable O&M costs were significantly less. If power rates increase in the future, the benefit of the solar power system would be greater. Additionally, newer thin-film solar panel technology is emerging that could ultimately reduce the cost per watt installed for photovoltaics. Kennedy/Jenks recommends a more detailed study of the solar power system.

8.2.9 Schedule

Negotiations may take up to one year. Permitting, design, construction, and startup are likely to require an additional 3 to 4 years to complete.

8.3 Nacimiento Water Supply

The Nacimiento Water Supply would consist of pumping Lake Nacimiento water “over-the-hill” where it would recharge the aquifer at Palmer Flats. It would then be extracted from Palmer Flats and pumped to the San Simeon well field to enter the distribution system. The Nacimiento Water Supply assumes an independent CCSD pipeline as means of conveying Nacimiento water to CCSD.

The alternative has previously been evaluated in the following studies:

- Engineering-Science, Inc., “Comparative Analysis of Potential Long-Term Water Supply Projects for the District,” 1991. (1991 report)

- Boyle Engineering Corporation, “Preliminary Evaluation for the Nacimiento Water Supply Project: Phase I Reliability Evaluation,” 1992. (1992 reliability report)

- Engineering-Science, Inc., “Preliminary Design and Evaluation of Long-Term Water Supply Projects,” 1992. (1992 report)

- Earth Science Associates, “Supplemental Information Potential Tunneling Costs Nacimiento Pipeline Alternative,” 1993. (1993 report)

- Jones & Stokes, “Operations Analysis and Technical Report,” 1993. (1993 report)

- Penfield and Smith, “Preliminary Analysis Long-Term Water Supply Project Pre-Final Design-Phase I Report,” 1993. (1993 report)

- Robert Bein, William Frost & Associates, ”Cambria Community Services District Long-Term Water Supply Projects Preliminary Wildlife Analysis for Proposed Project Alternatives,” 1993. (1993 report)

Numerous variations of this alternative have been proposed, including:

- Intake Sites (Main Channel East, Main Channel West, and Dip Creek)
- Pipeline Alternatives (Town Creek Route and Franklin Creek Route)
- Discharge Locations (North Fork San Simeon Creek and Steiner Creek Drainage Area)

8.3.1 Water Supply Capabilities

CCSD has an allocation of 2,000 AFY of water from Lake Nacimiento. This alternative was originally designed for 1,200 AFY during the dry season (approximately May 1 through October 31) with the option for extended pumping for the full allocation. However, with a 2.5 cfs flow rate, determined by the 1993 report, only 900 AFY would be pumped from Nacimiento during the dry season. With the 0.5 cfs loss due to the riparian environment in San Simeon

Creek as determined by the 1993 report, only about 730 AFY of the 900 AFY would be available for CCSD use. Based on the projected future water demand, this alternative would be sufficient to meet total and dry season demands for one of the projected water demand scenarios (Scenarios 4), with the 50 percent quality of life increase.

8.3.2 Water Quality

Because this alternative utilizes groundwater under the direct influence of surface water, disinfection would be required. Disinfection would occur by the addition of sodium hypochlorite at the wellhead, similar to treatment practices at CCSD's existing wells. Water quality at Palmer Flats would need to be monitored and meet the same water quality standards as the current groundwater source. Table 8-11 provides a comparison of CCSD groundwater to raw Lake Nacimiento water.

Although current percolation rates for the wastewater spray field are very high, the introduction of Lake Nacimiento water could cause a potential problem. An increase in potable water demands in the future could result in an increase in the volume of wastewater requiring treatment. Thus periodic pumping of percolated effluent may be required to prevent intrusion of the effluent into the existing groundwater supply.

TABLE 8-11
WATER QUALITY COMPARISON NACIMIENTO WATER SUPPLY

Constituent	Raw Lake Nacimiento[a]	San Simeon GW[b]
Sodium (mg/l)	6 to 10	18 to 19
Chloride (mg/l)	8 to 12	16 to 19
Nitrate (mg/l)	< 2	2.4 to 5.0
Total Dissolved Solids, TDS (mg/l)	150 to 300	340 to 380
Total Hardness, (mg/l as $CaCO_3$)	84 to 128	279 to 281
Iron (mg/l)	0.08 to 1.24	ND[c]
Manganese (mg/l)	0.01 to 2.8	ND

Notes:
(a) Source: Boyle Engineering. 2002. Report on Treatment of Lake Nacimiento Water.
(b) CCSD Consumer Confidence Report 2001.
(c) ND = not detected.

8.3.3 Required Infrastructure

Regardless of which intake location is selected, the following facilities would be required at the intake site: HDPE pipe extending to the lake bottom, including some submarine pipeline through the Las Tablas arm; an intake screen; fish screens and strainers with backwash to a small drying bed; a closed 30,000 gallon holding tank; and three booster pump stations. In order to provide vehicular access, new roads leading to the facility would be constructed. The cost and complexity of the required infrastructure is dependent on the pipeline route. Figure 4-2 provides a general layout of the proposed pipeline route alignments.

The pipeline routes would require 8 to 10 miles of steel pipe with welded joints and construction of access roads. The pipeline is the most extensive part of infrastructure and is responsible for a majority of the cost.

The two pipeline alternatives found by the 1993 report to be the most feasible are the Town Creek and the Franklin Creek Route alternatives. The Town Creek Route alternative utilizes the Main West Channel intake site and discharges into the North Fork of San Simeon Creek. The Franklin Creek Route can originate at the Main Channel East site or the Dip Creek Site and discharges into Steiner Creek Drainage area. Table 8-12 provides a comparison of the two pipeline alternatives.

TABLE 8-12
NACIMIENTO WATER SUPPLY PIPELINE ROUTE ALTERNATIVES

Pipeline Route	Possible Intake Sites	Release Point	Miles of Pipeline	Accessibility
Town Creek	Main Channel West	North Fork San Simeon Creek	8.7 miles total with 3,000 ft submarine	Requires more new road construction but through less densely populated areas
Franklin Creek	Main Channel East Dip Creek	Steiner Creek Drainage Area	10 miles total with 1,000 ft submarine	More existing roadways but through more densely populated areas

Regardless of the intake site or pipeline route chosen, energy dissipaters and erosion control facilities are required at the point of release into the creek. This would involve concrete and rip-rap. At Palmer Flats, two new extraction wells with 175 horsepower pumps would also be constructed and 2.7 miles of 10-inch PVC pipe would be required to carry the water to the San Simeon well field located downstream. The extracted groundwater would enter the distribution system at this location. Additional pressure does not appear necessary. An additional well may be required if dewatering of the wastewater spray field is necessary to prevent intrusion into the well field.

In addition to the proposed pipeline route alternatives, the 1993 report recommended using a 24-hr pumping schedule with a diversion rate of 2.5 cfs. This pumping schedule would require a total horsepower of 1,100 and a 12-inch steel pipeline. Discussions with PG&E found that the current transmission lines can only start a 250 hp pump but can operate at 2,400 hp. Thus, if pump sizes greater than 250 hp were required, a new transmission line would need to be constructed. The current design recommended by the 1993 report utilizes pumps less than 250 hp so that a new transmission would not be needed. Although additional booster stations were investigated, the 1993 report recommended using only one pump station, as it had the lowest capital cost. However, one station would involve a working pressure considerably higher than normal (1,100 psi versus 350 psi). Accordingly, it is recommended that the three pump station option described in the 1993 report be utilized to lower the working pressure in the pipeline to 350 psi.

8.3.4 Reliability

The 1993 report assessed the reliability of this alternative by developing models of the San Simeon Basin and watershed and estimated lake diversion rates through seasonal changes. It concludes that in order for this alternative to be feasible, a 2.5 cfs diversion rate from the lake and 2.0 cfs rate entering Palmer Flats would be required. The expected 0.5 cfs loss due to the riparian environment in San Simeon Creek is an estimate based on parameters defined in the model. These data were used to determine the size and type of pipeline required to handle the pressures and surge potential for this alternative. Furthermore, the 1993 report identified the need for the two additional wells at Palmer Flats and the pipeline necessary to convey the water to San Simeon well field. The slow natural rate of transport from Palmer Flats to the production well field could result in a recharge rate less than the extraction rate, resulting in temporary overdraft. Potential temporary overdraft could affect the availability of the water supply, thus reducing its reliability. Although the exact natural rate of transport cannot accurately be assessed, to increase reliability, extraction wells would be added at Palmer Flats to prevent the potential for this overdraft.

Geological studies conducted by Earth Science Associates (ESA) indicate that although both pipeline routes traverse several faults, the potential for movement is minimal. Terrain appears stable and any landslides that may occur would be small. Thus, the pipeline should have an acceptable risk in an emergency situation, such as an earthquake or a landslide. These conclusions were based on observations made from aerial photo coverage. A more detailed investigation should be conducted prior to design and construction.

The 1992 reliability report estimated the overall reliability for SLO County's 17,500 AFY entitlement, which included the 2,000 AFY for CCSD. It concluded that the alternative would have been 100 percent reliable, even through a five-year drought period. The study period covered October 1950 through November 1990. The report concluded, however, that the allocations might have decreased during critical periods (December 1990-February 1991), but increased to full entitlement later in 1991. Accordingly, it is probable that supply from Lake Nacimiento may be limited during the same period when CCSD's would require it most (i.e., critically dry water years).

8.3.5 Required Agreements/Institutional Issues

For this alternative, only a few agreements would be required. As discussed in the 1992 reliability report, an agreement between Monterey County and SLO County would need to be made to modify the diversion point such that Monterey County ceases releases at an elevation of 689 ft, in order to maintain a minimum pool of 12,000 AF above the historic low level elevation. Monterey County has indicated that these modifications would not be a problem. This minimum pool provides the necessary reliability to SLO County's entitlement of Lake Nacimiento water. Accordingly, this minimum pool would also affect the reliability of CCSD's Nacimiento allocation.

An agreement is necessary between CCSD and the County of SLO regarding the purchase cost of Nacimiento water. CCSD's allocation is not included in the 13,000 AF of the County's entitlement set aside for recreation, which has a cost of $26/AF. However, CCSD could request to be included. The request would most likely be approved but additional costs are likely to be added onto the $26/AF. These additions are expected to be minimal.

Additionally, several right-of-way acquisitions would be required for the access roads and pipeline. A 60 ft right-of-way parallel to the existing road and a 30 ft right-of-way for the temporary construction easement have been proposed. If the Franklin Creek Route were selected, additional right-of-way acquisitions would be required for the release into the Steiner Creek Drainage area.

8.3.6 Environmental Issues

The 1993 report identified several environmental issues in their preliminary biological impact studies. Reptile and amphibian species of special concern include the Red-Legged Frog, Yellowed-Legged Frog, Coast Range Newt, Two-Striped Garter Snake, and Southwestern Pond Turtle. Other species of special concern include the Monarch Butterfly, Golden Eagle and Prairie Falcon. Impacts to the federally-threatened Steelhead Trout were also considered. The main environmental concerns associated with this alternative are the concentrations of mercury and the warm water temperature found in Lake Nacimiento water.

One area of concern which still needs to investigated further is the potential bioaccumulation of mercury in the creek water as a result of the addition of mercury from Lake Nacimiento water. Mercury could impact the Red-Legged Frog and Southwestern Pond Turtle directly as well as the Golden Eagle and Prairie Falcons who feed on fish in the area. Moving the intake site and raising the intake sufficiently above the sediment should prevent sedimentation intake and reduce overall mercury concentrations. Concentrations would still need to be monitored at the creek release site to ensure mercury levels do not pose a hazard to wildlife.

Due to possible impacts on aquatic life, mercury levels, turbidity, and temperature must be considered in the selection of an intake site. The two Main Channel sites have lower mercury levels and lower sediment loading rates than the Dip Creek Site, which could result in better water quality. Although the Dip Creek site has higher mercury levels and a greater potential for higher sediment loading rates, placing the intake pipe slightly higher above the bottom should improve both of these conditions and improve water quality. Table 8-13 compares the water quality characteristics of the potential intake sites. Due to recent developments in the SVWP, as discussed in Section 4.3, further investigation may be necessary to determine potential impacts of the project on the current proposed intake sites, because lake levels may be affected. If lower water levels are expected, the proposed intake site locations may need to be moved closer to the middle of the lake in order to prevent sediment loading.

TABLE 8-13
WATER QUALITY CHARACTERISTICS OF THE NACIMIENTO WATER SUPPLY POTENTIAL INTAKE SITES

Proposed Intake Sites	Safe Elevation	Difference Between Safe and Historic Low Elevation[a]	Mercury Levels in Surface Water[b]	Mercury Levels in Sediment	Sediment Loading Rates
Main Channel East	685 ft	-15 ft	ND	0.02 μg/l	Low
Main Channel West	685 ft	-15 ft	ND	0.02 μg/l	Low
Dip Creek	675 ft	5 ft	0.02 μg/l	ND-0.184 μg/l	Medium

Notes:
(a) Historic Low Elevation is 670 ft
(b) RWQCB Basin Plan sets a 90 percentile maximum concentration of 0.2 micrograms (μg/l) with an average value not exceeding 0.05 μg/l for aquatic life. Revisions are currently being made to the Basin Plan and thus these limits may change.

Source: Penfield and Smith. 1993. Preliminary Analysis Long-Term Water Supply Project Pre-Final Design-Phase I Report.

The mitigation measures for mercury control and sediment loading recommended by the 1993 report (i.e., raising the intake structure, moving the intake site, and using low flow rates) would also help to control turbidity. However, the difference in water temperature between warmer

Lake Nacimiento and cooler San Simeon Creek could be detrimental to the existing cold-water species in San Simeon Creek. As a means of controlling the elevation of water temperature, the holding tank would be painted silver to reflect light and shading of the tank would also be provided. The outfall into the creek would be heavily shaded to facilitate cooling prior to contact with cold-water species. Furthermore, the release point would be selected to allow for sufficient cooling time before contact with the cold-water species.

Another potential environmental issue is the introduction of warm-water species into the creek that are not compatible with the protected cold-water species or Red-Legged Frog. Design modifications to the intake structure, the addition of fish screens and strainers with a backwash, and the use of low flow rates should significantly reduce the risk of warm-water species and their eggs passing through the intake facility.

Once flow is started during the dry season, it must be maintained until rain from the following wet season can provide the same flow rate to ensure survival of the fish population already established. Additionally, the Franklin Creek Route pipeline alternative, which discharges into Steiner Creek, is preferred from an environmental standpoint, because it allows for more Steelhead Trout rearing habitat. Past CCSD concerns with the Nacimiento alternative also focused on the development of an artificial habitat from pumping water over the mountains. Once an artificial habitat is developed, pumping may have to continue regardless of whether it is called for by existing customer demands. If such a scenario were to develop, this would add to the variable costs.

The 1993 report found no major direct impacts to botany/wetlands, but recommended monitoring for any delayed impacts.

8.3.7 Permitting/CEQA

For this alternative, numerous permits would be required. Table 8-14 provides a complete list of the permits required for this alternative, updated from that provided in the 1993 report. A few of the more difficult permits to obtain are discussed below.

CCSD must obtain an NPDES permit for the discharge/recharge at Palmer Flats as required by the RWQCB. Additionally, a construction NPDES permit would be required for this alternative. Best Management Practices (BMPs) such as erosion control and dust control would be required during construction. Extensive re-vegetation along the pipeline route would also be required.

A U.S. ACE Section 10 Permit would be required as a result of the intake structure, which could create a potential navigational hazard for boaters. For the Main Channel intake sites, the historic low lake elevation (670 ft) falls below the safe elevation (685 ft), the elevation required to maintain the 10 ft pool, creating a potential hazard. Warning buoys surrounding the intake area are permit-required as a safety precaution. The safe elevation for the Dip Creek site, however, does not fall below the historic low and thus minimizes the potential navigational hazard. A permit would still be required but should be less difficult to obtain. Warning buoys would still be used as a precautionary measure.

Additionally, a new diversion permit from the SWRCB would be required for the diversion of water at Palmer Flats. This permit should provide a maximum rate of diversion, maximum annual diversion, and maximum dry season diversions.

A Section 106 Review permit may be required from the State Historic Preservation Office because Chumash archaeological sites are known to be within the area of the proposed pipeline. If identified during final design or construction, these areas should be avoided or built around.

As a result of the unknown mercury impacts, additional documentation would need to be conducted prior to approval of this alternative. Additionally, an EIR would likely be necessary to meet the requirements of CEQA.

TABLE 8-14
LIST OF REQUIRED PERMITS FOR THE NACIMIENTO WATER SUPPLY

Agency	Permit Description	Permit Jurisdiction
Local Permits		
County of SLO, Public Works Department	Encroachment Permits and Grading Permits	Required for work with road right-of-way; grading activities
County of SLO, Building and Planning Department	Land Use Permit	Required for changes in land use
State Permits		
California Regional Water Quality Control Board	National Pollutant Discharge Elimination System Permit (NPDES)	Required for discharge to watershed
California Regional Water Quality Control Board	Storm Water NPDES	Required for construction activities; storm water discharge
State Water Resources Control Board	Permit for Diversion and Use of Water	Required for diversion from groundwater basin
Department of Fish and Game	Stream or Lake Alteration Agreement	Required for activities in rivers, streams, or lakes
California Energy Commission	NOI and Application for Certification for Plants and Transmission Lines	Required for Electrical Transmission Lines
Federal Permits		
U.S. Army Corps of Engineers	Section 404	Required for projects affecting wetlands, inland waters, lakes, rivers, etc.
U.S. Fish and Wildlife	Fish and Wildlife Coordination Act Section 10 (a) Permit Endangered Species Act	Required for stream crossings; conservation of endangered species
State Historic Preservation Office	Section 106 Review	National Historic Preservation Act of 1966
U.S. Army Corps of Engineers	Section 10 Permit	Required for navigable waterways

Source: Penfield and Smith. 1993. Preliminary Analysis Long-Term Water Supply Project Pre-Final Design-Phase I Report.

8.3.8 Costs/Funding

Table 8-15 provides a summary of the capital costs associated with this alternative.

Fixed cost refers to capital costs relating to infrastructure required regardless of the pipeline route chosen. It includes the cost of the two wells at Palmer Flats, the 2.7 miles pipeline, the pump for spray field dewatering, diversion structure, power development cost, mitigation monitoring and re-vegetation.

The Route cost includes right-of-way costs, road construction, re-vegetation, cleaning, submarine pipeline, and trench costs specific to the given pipeline route.

Pump Station Cost includes the costs of the infrastructure required for all three pump stations (i.e., pumps, building/controls, and strainer/tank at Pump Station No. 1.)

TABLE 8-15
ESTIMATED CAPITAL COST (2002) FOR THE NACIMIENTO WATER SUPPLY

Description of Cost[a]	Town Creek Route	Franklin Creek Route
Fixed	$1,996,000	$1,996,000
Route	$7,661,000	$8,228,000
Pipeline	$968,000	$1,094,000
Pump Stations	$1,572,000	$1,572,000
Subtotal	$12,197,000	$12,890,000
Contingency[b]	$3,659,000	$3,867,000
Engineering/legal[c]	$1,830,000	$1,934,000
Total	$17,686,000	$18,691,000

Notes:
(a) Source: Penfield and Smith. 1993. Preliminary Analysis Long-Term Water Supply Project Pre-Final Design-Phase I Report.
(b) Evaluated at 30 percent.
(c) Evaluated at 15 percent.

Fixed annual and variable O&M costs for this alternative are provided in Table 8-16. Pumping may be necessary to maintain stream flow for aquatic habitat. Thus CCSD may have to continuing pumping beyond the amount needed to meet demand. Additionally, pumping could significantly increase the variable O&M costs.

TABLE 8-16
ESTIMATED O&M COSTS (2002) FOR THE NACIMIENTO WATER SUPPLY

Description of Cost	Town Creek Alternative	Franklin Creek Alternative
Fixed O&M Costs:		
Pump Stations[a]	$16,000	$16,000
Pipeline[b]	$1,000	$1,000
Structures[b]	$2,000	$2,000
Labor[c]	$142,000	$142,000
Total Fixed ($/yr)	$161,000	$161,000

Description of Cost	Town Creek Alternative	Franklin Creek Alternative
Variable O&M Costs:		
Power costs[d]	$555	$530
Water Purchase cost	$26	$26
Total Variable ($/AF)[e]	$580	$560

Notes:
(a) Estimated at 1.0 percent of capital cost.
(b) Estimated at 0.1 percent of capital cost.
(c) Estimated at two full-time operators at $34/hr (which includes overhead and benefits) for 8 hours per day and 260 days per year. (The hourly rate is different from Desalination alternative because this alternative requires a lower grade level operator.)
(d) Calculated using 80 percent pump efficiency, 90 percent motor efficiency, an electricity rate of $0.15/kW-hr, and 184 days of operation. Pumping costs for Palmer Flats were also included.
(e) Total Variable cost were rounded to the nearest $10/AF.

Table 8-17 provides a cost summary for this alternative. The annualized capital cost was calculated based on a 4 percent interest rate and a life span of 30 years.

TABLE 8-17
COST SUMMARY (2002) FOR THE NACIMIENTO WATER SUPPLY

Pipeline Route Alternative	Capital Cost	Annual Capital Cost[a]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)
Town Creek	$17,686,000	$1,023,000	$161,000	$1,184,000	$580
Franklin Creek	$18,691,000	$1,081,000	$161,000	$1,242,000	$560

Note: (a) Calculated using a 4 percent interest rate and 30-year life span.

Both the federal and state governments have policies to encourage groundwater recharge projects. These policies have led to several grant and low interest loan programs. Available funds for grants and low interest loans are dependent upon legislative approval and available monies. CCSD may be able to obtain a low interest loan for construction of this alternative through the Department of Water Resources Proposition 13. Prop 13 supports construction projects, which involve recharge facilities to increase supply reliability. No more than $5 million will be awarded to a single project and cost-shared projects will receive priority.

In an attempt to reduce the power cost associated with this alternative, the use of positive displacement pumps in place of the vertical turbines was evaluated. Although positive displacement pumps are generally not used for this application, potential benefits from higher efficiency pumps are possible. If positive displacement pumps were utilized (assuming the 90 percent pump efficiency and 95 percent motor efficiency) less than 700 hp would be required. Although positive displacement pumps are more efficient, they also tend to be more expensive. There would also be an increase in the maintenance cost and capital cost. Thus the O&M cost for the pump stations was assumed to be 2 percent of the capital cost instead of the 1 percent used for the turbine option. Furthermore, this scenario was developed using a one pump station (1,100 psi working pressure) due to the nature of the pumps. Displacement pumps only retain their efficiency at the higher pressures, thus for the three pump station option (350 psi) the increased capital cost was not justified by a reduction in power cost. Table 8-18 provides the cost summary for the positive displacement pump option with one pump station.

TABLE 8-18
COST SUMMARY (2002) FOR THE NACIMIENTO WATER SUPPLY WITH POSITIVE DISPLACEMENT PUMPS

Pipeline Route Alternative	Capital Cost	Annual Capital Cost[(a)]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)
Town Creek	$18,122,000	$1,048,000	$168,000	$1,216,000	$510
Franklin Creek	$19,271,000	$1,114,000	$168,000	$1,282,000	$490

Note: (a) Calculated using a 4 percent interest rate and 30-year life span.

Based on these results, the positive displacement option was concluded to be comparable to the turbine option. However, due to the positive displacement option requiring a working pressure of 1,100 psi in the pipeline, it is not recommended.

8.3.9 Schedule

Construction can start after an EIR and design are completed and all right-of-way acquisitions, permits, and agreements have been obtained. The diversion permit may take up to three years to obtain and is required before construction may begin. This project may take 5 to 7 years to implement.

8.4 Whale Rock Exchange

This alternative involves an exchange of water rights from Lake Nacimiento for water rights to Whale Rock Reservoir and utilizes the regional Nacimiento pipeline. This alternative has been studied in the following previous documents:

- Cambria Community Services District, "Master Water Plan Update," 1986.
- Boyle Engineering Corporation, Inc., "Economic Analysis of Alternative Water Resources Development," 1987. (1987 report)
- Engineering-Science, Inc., "Comparative Analysis of Potential Long-Term Water Supply Projects for the District," 1991. (1991 report)
- Nacimiento Participants Advisory Committee, "County of San Luis Obispo Nacimiento Water Supply Project: Project Cost with Delivered Water Cost for Major Reaches," 2001.
- Carollo Engineers, "EIR Preparation Phase Engineering Report," 2002.

Two different supply capacities were previously evaluated for this alternative. One capacity was evaluated in the 1987 report and produces 1,000 AFY. The second was evaluated in the 1991 report and produces 700 AFY. For the purpose of this evaluation, the two options are referred to by their supply capabilities. Both would utilize the regional Nacimiento pipeline to deliver the Nacimiento water to Whale Rock Reservoir. Required infrastructure, agreements, permits, environmental issues associated with the Regional Nacimiento pipeline are not addressed in this discussion because the County of SLO will be responsible for these issues. Due to the added complexity of these factors, if included in the evaluation the overall ranked score for this alternative would most likely decrease. Furthermore, this alternative is only viable if the Regional Nacimiento pipeline is constructed and operated.

8.4.1 Water Supply Capabilities

Based on CCSD's allocation to water from Lake Nacimiento a maximum of 1,200 AFY is available for the exchange. The original evaluation of this alternative allowed for an exchange of 1,000 AFY; however, the 1991 report lowered the supply capacity to 700 AFY. Based on future total and dry season demand, the 1,000 AFY option would provide sufficient supplemental water supply if used in conjunction with the existing groundwater sources to meet the projected demands of all four scenarios, with the 50 percent quality of life increase. The 700 AFY option would be sufficient to only meet one of the projected water demand scenarios (Scenarios 4), with the 50 percent quality of life increase.

8.4.2 Water Quality

Source water for Whale Rock Reservoir is the natural runoff from Cottontail and Santa Rita Creeks. Although the water quality of the runoff is good, the water from the Whale Rock Reservoir would require filtration and disinfection in accordance with the Safe Drinking Water Act. The addition of Nacimiento water is not expected to adversely affect the water quality in the Whale Rock Reservoir because it is very likely the Nacimiento water would be treated prior to entry into the Whale Rock Reservoir. Table 8-19 provides a summary of the water quality comparison between Lake Nacimiento water and water from the San Simeon Basin.

TABLE 8-19
WATER QUALITY COMPARISON WHALE ROCK EXCHANGE

Constituent	Raw Lake Nacimiento[(a)]	San Simeon GW[(b)]
Sodium (mg/l)	6 to 10	18 to 19
Chloride (mg/l)	8 to 12	16 to 19
Nitrate (mg/l)	< 2	2.4 to 5.0
Total Dissolved Solids, TDS (mg/l)	150 to 300	340 to 380
Total Hardness, (mg/l as $CaCO_3$)	84 to 128	279 to 281
Iron (mg/l)	0.08 to 1.24	ND[(c)]
Manganese (mg/l)	0.01 to 2.8	ND

Notes:
(a) Source: Boyle Engineering. 2002. Report on Treatment of Lake Nacimiento Water.
(b) CCSD Consumer Confidence Report 2001.
(c) ND = not detected.

8.4.3 Required Infrastructure

Infrastructure required for to convey the water from Whale Rock Reservoir to CCSD is dependent upon which supply option is chosen. Figures 4-3 and 4-4 provide a general layout of the pipeline alignments for this alternative. The Regional Nacimiento Pipeline has been designed to include the 1,200 AFY of water for CCSD use.

For the 1,000 AFY option, 15.3 miles of 16-inch pipeline, two pump stations, and a treatment plant would be required. The treatment plant could be located in Cambria or alternatively could be located elsewhere if other the other coastal communities are included in the exchange. The treatment plant would be designed for a 3.8 MGD flow rate and would have a 2.2 MG storage tank. The pipeline would follow Highway 1, outside of CalTRANS right-of-way, for a majority of the route. Major pavement replacement would be required and right-of-way would need to be obtained.

For the 700 AFY option, 13.1 mile of 8-inch pipeline, one pump station, and a smaller treatment plant would be required. At least a quarter acre of land would be required for the treatment plant and pump station. The pipeline would follow the same route as for the 1,000 AFY option. This option does not include the infrastructure required to boost the pressure for distribution needs.

8.4.4 Reliability

Reliability of this alternative is not dependent upon which option is selected, because the pipeline route and source water are identical. No geological hazards were found along the pipeline route and thus the structural reliability should be high. The Whale Rock Reservoir, from a hydrologic perspective, is considered a reliable source. Although the recharge of the reservoir is rainfall dependent, safe yields have been established to protect the availability. Because this alternative involves an exchange of water rights, reliability may be affected by water levels at Lake Nacimiento. Accordingly, the supply available during the dry season may be restricted when water levels at Lake Nacimiento drop.

8.4.5 Required Agreements/Institutional Issues

The required agreements and institutional issues are not dependent upon the supply capacity chosen.

The exchange would occur as follows: The City of SLO would exchange a portion of its water rights from Whale Rock Reservoir to SLO County. SLO County would then distribute the Whale Rock rights to coastal communities (including CCSD). The communities would exchange their allocations of Nacimiento water to SLO County. SLO County would exchange those allocations of Nacimiento water to the City of SLO. This alternative is dependent upon completion of SLO County Nacimiento project and the City of SLO's involvement in the project. Accordingly, the feasibility of this alternative is difficult to determine.

Right-of-way for pipeline along Highway 1 would also need to be obtained outside of the current right-of-way for CalTRANS. This could be very challenging as the proposed pipeline is 13.1 to 15.3 miles long and numerous landowners may be involved.

8.4.6 Environmental Issues

Because this alternative utilizes water from an existing reservoir, the environmental issues associated with the reservoir have already been established. Because significant environmental issues at Whale Rock Reservoir have not emerged, the primary environmental concern is associated with the pipeline route and locations of the pump stations and treatment facility. Of particular concern are the Tidewater Goby, Red-Legged Frogs, Southwestern Pond Turtle, and steelhead fisheries which have been identified in creeks that the pipeline would need to cross.

Special care must be taken during construction to minimize the impact to these habitats. The pipeline route would avoid these habitats when possible. Revegetation would also likely be required as a mitigation measure.

8.4.7 Permitting/CEQA

Permits would be required for the construction of the pipeline, pump station, and treatment facilities. These permits would likely include encroachment permits from CalTRANS and SLO County.

Construction of the pipeline and pump station would require preparation of an environmental impact analysis documentation in accordance with CEQA. If construction is to remain largely within existing roadways, then it is possible that a Mitigated Negative Declaration would be adequate.

8.4.8 Costs/Funding

The capital cost associated with this alternative is dependent on the supply option chosen. For the purpose of this evaluation the cost of the regional Nacimiento pipeline is included as a water purchase cost and is not included in the capital cost or O&M cost estimates.

The pipeline cost includes the cost of the pipeline between Whale Rock and CCSD and the required right-of-way. The pump station cost includes the pumping facilities and the pumps. The treatment plant cost includes all necessary infrastructure for the plant as well as right-of-way required for the land. The construction/mitigation cost includes pavement replacement, revegetation and construction costs. Table 8-20 provides a summary of the capital cost for each option. Based on these cost estimates the 1,000 AFY option does not appear cost effective without the agreement with other agencies to share costs.

TABLE 8-20
ESTIMATED CAPITAL COSTS (2002) FOR THE WHALE ROCK EXCHANGE

Description of Cost	700 AFY[(a)]	1,000 AFY[(b)]
Pipeline	$2,262,000	$6,071,000
Pump Stations	$51,000	$750,000
Treatment Plant	$178,000	$7,290,000
Construction/Mitigation	$155,000	$4,880,000
Subtotal	$2,646,000	$18,990,000
Contingency[(c)]	$794,000	$5,697,000
Engineering/legal[(d)]	$397,000	$2,849,000
Total	$3,837,000	$27,536,000

Notes:
(a) Source: Engineering-Science, Inc. 1991. Comparative Analysis of Potential Long-Term Water Supply Projects for the District.
(b) Source: Boyle Engineering Corporation, Inc. 1987. Economic Analysis of Alternative Water Resources Development.
(c) Evaluated at 30 percent.
(d) Evaluated at 15 percent.

Fixed annual and variable O&M costs were estimated by evaluating power costs, parts costs, and labor costs. Costs associated with the Regional Nacimiento project are included as the estimated water purchase costs determined by the County of SLO. This purchase costs accounts for the estimated capital and O&M costs for the pipeline and treatment facility. Table 8-21 provides a summary of the O&M costs for each option.

TABLE 8-21
ESTIMATED O&M COSTS (2002) FOR THE WHALE ROCK EXCHANGE

Description of Cost	700 AFY	1,000 AFY
Fixed O&M Costs		
Pipeline[(a)]	$2,000	$6,000
Pump Station[(b)]	$600	$8,000
Labor[(c)]	$62,000	$97,000
Total Fixed ($/Yr)	$65,000	$111,000
Variable O&M Costs		
Power costs[(d)]	$200	$200
Treatment Costs[(e)]	$10	$300
Water Purchase Cost[(f)]	$1,710	$1,710
Total Variable ($/AF)	$1,920	$2,210

Notes:
(a) Evaluated at 0.1 percent of capital cost.
(b) Evaluated at 1.0 percent of capital cost.
(c) Evaluated at 7 man-hrs/day for the 700 AFY option and 11 man-hrs/day for the 1,000 AFY option, 260 days/Y, and $34/hr, including benefits.
(d) Evaluated using an electricity rate of $0.15/kW-hr and 294 days of operation for 700 AFY option and 184 days of operation for the 1,000 AFY option. A pump efficiency of 80 percent and a motor efficiency of 90 percent were assumed. Evaluated at 4.0 percent of capital cost, including chemical cost.
(e) Evaluated at 2.0 percent of capital cost, including chemical cost.
(f) Water purchase cost with O&M and treatment included. Source: Nacimiento Participants Advisory Committee. 2001. County of San Luis Obispo Nacimiento Water Supply Project: Project Cost with Delivered Water Cost for Major Reaches.

Table 8-22 provides a cost summary for this alternative. Additional wheeling costs may be added to utilize the existing Chorro Valley pipeline from the City of SLO to Whale Rock Reservoir.

TABLE 8-22
COST SUMMARY (2002) FOR THE WHALE ROCK EXCHANGE

Supply Alternative	Capital Costs	Annual Capital Cost[(a)]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)
700 AFY	$3,837,000	$222,000	$65,000	$287,000	$1,920
1,000 AFY	$27,536,000	$1,592,000	$111,000	$1,703,000	$2,210

Note: (a) Calculated using a 4 percent interest rate and a 30-year life span.

No state or federal funding is available for this alternative. However, it may be financed with low interest loans/bonds or through cash reserves with the O&M costs being covered by water rates charges.

8.4.9 Schedule

Negotiations are likely to take more than one year. Permitting, design, construction, and startup are likely to require an additional 2 to 3 years. This alternative may be delayed by the SLO County Nacimiento project. The City of SLO may require the availability of water from the Nacimiento Project prior to implementation of a Whale Rock water exchange.

8.5 Hard Rock Drilling

As described in Section 4.7, hard rock drilling at a new location south of CT Ranch may be an alternative water supply source that could be available to CCSD. Hard rock water supplies are acknowledged to be high-risk ventures where considerable capital investments must be made to develop the supply. The hard rock drilling company generally assumes the risk in the development of the project and then sells the water to the utility at a cost that is consistent with supplies in the local area. Typically, the company would enter into a 20-year contract for delivery of water. After 20 years, the facilities would be turned over to CCSD. If CCSD is willing to pay for some of the project facilities up front, then the length of the contract time could be shortened.

Hard rock drilling projects are typically approached in three phases of development. The upper range for the Phase I investigation, yield analysis, and test bore drilling is estimated to cost $250,000 depending on the number of test bores that are drilled. Up to 50 percent of the cost of Phase I may be shared with CCSD. In 1993, Phase I studies were conducted by Samda, Inc. These studies indicated that the original location for the wells had low supply potential. A new site located ½ mile north of Santa Rosa Creek, which included a four square mile area within the Monterey Pines Area, appeared to have a greater potential. Further Phase I testing would be required to explore this region in more detail.

8.5.1 Water Supply Capabilities

Although a borehole drilled within this new area was estimated to yield 100 to 200 gpm (162 AFY to 324 AFY), a more accurate assessment of the overall supply would be available upon completion of Phase I. This alternative is insufficient to meet the projected dry season water demands of any of the scenarios with the 50 percent quality of life increase.

8.5.2 Water Quality

Although water quality reports from the previous studies indicated poor water quality at the CT Ranch boreholes, a more detailed assessment of the water quality at the new site would be available after completion of Phase I. It is anticipated that treatment would be required, the water quality is considered fair.

8.5.3 Required Infrastructure

This alternative would require construction of a new pipeline connecting the new well with the existing CCSD distribution system. A treatment plant may also be necessary depending upon the groundwater quality.

Typically, the drilling company would bear the cost of constructing a treatment system, if necessary. If significant treatment were required, it would likely be included in the cost of the delivered water. The level of treatment would be determined after completing Phase 1 and would determine the attractiveness and cost effectiveness of hard rock groundwater as a potable water supply.

The drilling company also typically would deliver the water to CCSD distribution system. If CCSD is willing to provide up front capital cost, CCSD could extend the distribution pipeline closer to the well site, shortening the contract period.

8.5.4 Reliability

Typically, the drilling company evaluates the water supply for long-term reliability. They perform a yield analysis and do not mine aquifers beyond the expected recharge rate. During the pump testing that occurs in Phase II, the drilling company staff observes nearby springs and wells to evaluate the impacts of pumping on overall water levels.

8.5.5 Required Agreements/Institutional Issues

In order to proceed, CCSD would need to enter into a new agreement with a hard rock drilling company to pursue Phase I evaluation for the Cambria area. Because the current viability of Samda, Inc. could not be verified, an alternative turnkey provider may need to be identified. The availability of such a provider is unknown.

Because CCSD does not own the land where this exploration would take place, an agreement with current property owner would need to be made.

One of the concerns that have been raised is the water rights associated with hard rock drilling. Typically, the drilling company would drill for new water that does not infringe on any existing rights. The goal of hard rock drilling is to intercept fractures that may be going to the ocean. As a result, the drilling company typically does not file for appropriative water rights.

8.5.6 Environmental Issues

Environmental impacts have not yet been evaluated but may involve concerns for the habitats of the Red-Legged Frog and Southwestern Pond Turtle, which have been identified in the Cambria area. When possible, areas were these habitats are found should be avoided. Mitigation measures would most likely include revegetation. The appropriate CEQA documentation must be prepared to analyze the potential environmental impacts. Furthermore, the new site is located within the Monterey Pines area and thus impacts to the Pines as a result of the hard rock mining would need to be evaluated. It may be possible to reduce the impact to the Pines with the use of sufficient surface casings.

8.5.7 Permitting/CEQA

The drilling company is responsible for all permitting associated with the Phase I exploration. CCSD would, however, be responsible for the preparation of any CEQA documentation required for the construction of the infrastructure.

8.5.8 Costs/Funding

The typical cost for a Phase I study is $250,000 of which the drilling company could pay up to 50 percent. CCSD would therefore be responsible for approximately $125,000. Water purchase costs afterwards would be approximately $1,000 per AF of delivered water for a total cost of $1,024 per AF. This cost is negotiable and could depend on the costs of other locally available water.

This alternative is not likely to involve any state or federal funding opportunities. The capital cost of the infrastructure would have to be borne by water rates and/or connection fees. O&M costs would be included in water rate charges.

8.5.9 Schedule

After negotiations of the contract with a hard rock drilling company, exploration could start immediately. Design, permitting, construction, and startup of the necessary infrastructure would take approximately 2 years. This alternative is always available and can be reevaluated annually.

8.6 Recycled Water

As discussed previously, this alternative would involve the use of recycled water for irrigation to reduce potable water demand. The 2004 report, "Task 3: Recycled Water System Modeling," by Kennedy/Jenks evaluated potential recycled water demands and recommended a recycled water system. For purposes of this report, additional evaluation of the necessary WWTP upgrade to meet existing recycled water regulations was performed.

Two federal acts that regulate the discharge and use of recycled water or wastewater are the Clean Water Act and the Safe Drinking Water Act. State regulations include Title 22 and Title 17 requirements. Title 22 establishes the quality and/or treatment processes required for an effluent to be used for a specific non-potable application. The following categories of recycled water are identified:

- Disinfected tertiary recycled water
- Disinfected secondary-2.2 recycled water[25]
- Disinfected secondary-23 recycled water[26]
- Undisinfected secondary recycled water

In addition to recycled water uses and treatment requirements, Title 22 addresses sampling and analysis requirements at the treatment plant, preparation of an engineering report prior to production or use of recycled water, general treatment design requirements, reliability requirements, and alternative methods of treatment.

A draft regulation issued 23 April 2001 addresses Groundwater Recharge Reuse. The regulation establishes requirements for the engineering report and monitoring and reporting for projects that use recycled water for groundwater recharge. Title 17 focuses upon the protection of drinking

[25] The 2.2 refers to the coliform count requirement for the water – 2.2 MPN/100 mL.
[26] The 23 refers to the coliform count requirement for the water – 23 MPN/100 mL.

(potable) water supplies through control of cross-connections with potential contaminants, including non-potable water supplies such as recycled water. The recycled water system alternative was designed to meet with the regulations outlined in Title 22 and Title 17.

8.6.1 Water Supply Capabilities

The Recycled Water alternative would allow CCSD to reduce its potable water demand. The reduction in potable water demand would be equivalent to the non-potable recycled water demand. Potential recycled water users were identified by CCSD staff; all are existing or future non-residential potable water users with significant irrigable areas. Recycled water demands were calculated using irrigable acreage of each potential user and an application rate for turf-type vegetation. Turf is the most prevalent type of vegetation for the potential recycled water users. An estimate for irrigation demands was based on the following formula:

$$\textit{Irrigation demand (inches)} = \{[k_c(ET_o) - P] \times LR\} / IE$$

Where:

k_c= a crop coefficient factor of 0.8 for warm weather grasses[27]
ET_o= reference crop evapotranspiration[28]
P= precipitation in inches[29].
LR= leaching rate past the root zone.
IE= irrigation efficiency.

For conventional irrigation systems, approximately 25 percent of precipitation is lost to run-off, an additional 10 percent is needed to pass salts through the root zone, and an irrigation efficiency of 70 percent were assumed. Thus the equation simplifies to:

$$\textit{Irrigation demand (inches)} = \{[0.8(ET_o) - (P \times 0.75)] \times 1.10\} / 0.70 \approx 2.63 \text{ ft per year}$$

In addition to conventional system, a more water-efficient system was proposed for the Santa Lucia middle school, future elementary school, and future community park. The proposed Evaporative Control Systems, Inc. (ECS) system supplies plants from the root zone upward and consists of subterranean pans and pipes placed under turf grass, with sand and top soil placed above the distribution system. For an ECS system, no precipitation is lost to run-off, no additional water is required to pass salts through the root zone, and irrigation efficiency is assumed to be 100 percent. Thus the equation simplifies to:

$$\textit{Irrigation demand (inches)} = \{[0.8(ET_o) - (P \times 1.0)] \times 1.0\} / 1.0 \approx 1.59 \text{ ft per year}$$

This application rate was applied to the Santa Lucia middle school, future elementary school, and future community park. The total non-potable demand without the ECS system is 184 AFY. The total non-potable demand with the ECS system is 162 AFY. This alternative would not provide the necessary reduction in potable water demand to make sufficient potable water available to meet any of the four projected water demand scenarios with or without the ECS system. The potential recycled water users, their irrigable areas, and non-potable demands are presented in Table 8-23.

[27] DWR Bulletin 113-3.
[28] 1998 USGS Report 98-4061, Yates & Von Konyenburg, Table 5, p.53
[29] Average of monthly values from WWTP gage, 1974 through 1992

TABLE 8-23
POTENTIAL RECYCLED WATER USERS AND DEMANDS

Potential Recycled Water User	Total Acreage	Percent Irrigable[(a)]	Irrigable Acreage	Irrigation Demand	Demand w/ECS
Likely Recycled Water Sites					
Existing Potable Water Irrigation Sites					
Existing WWTP site	12.51	6%	0.75	1.97	1.97
Mid State Bank	0.93	7%	0.07	0.17	0.17
Santa Rosa Catholic Church	2	20%	0.40	1.05	1.05
Tamson Dr. commercial areas	9.5	5%	0.48	1.25	1.25
Cambria Grammar school (as CUSD offices)	5.07	22%	1.12	2.93	2.93
Cambria Pines Lodge	23.4	35%	8.19	21.54	21.54
CCSD Fire Station	1.4	30%	0.42	1.10	1.10
Presbyterian Church	2.98	35%	1.04	2.74	2.74
Cambria Nursery	4.35	45%	1.96	5.15	5.15
Santa Lucia Middle School	10	40%	4.00	10.52	6.36
St. Paul's Episcopal Church	0.87	40%	0.35	0.92	0.92
Subtotal			18.76	49.35	45.19
Future Recycled Water Irrigation Sites					
CCSD vacant lot across from Vets Hall	1.45	15%	0.22	0.57	0.57
Future CCSD Community Park	26.03	50%	13.02	34.23	20.69
Main Street Landscaping	1.42	70%	0.99	2.61	2.61
Future Elementary School	12	35%	4.20	11.05	6.68
Future Vineyard Church site	3.53	15%	0.53	1.39	1.39
Subtotal			18.96	49.85	31.95
Subtotal of Likely Recycled Water Sites			37.72	99.21	77.14
Less Likely Recycled Water Sites					
Riparian Well Services					
Shamel Park	2.04	85%	1.73	4.56	4.56
Coast Union High School	13.94	60%	8.36	22.00	22.00
Subtotal			10.10	26.56	26.56
Low Priority Sites Due to Distance from Main Recycled Water Pipeline					
Cambria Cemetery	12.18	90%	10.96	28.83	28.83
San Simeon Pines Motel	7.3	70%	5.11	13.44	13.44
San Simeon State Camp Grounds	25	25%	6.25	16.44	16.44
Subtotal			22.32	58.71	58.71
Subtotal of Less Likely Recycled Water Sites			32.42	85.26	85.26
Total of Likely & Less Likely Sites			70.14	184.47	162.41

Notes:
(a) Percent irrigable land was determined from land coverage estimates taken from aerial photos of the parcels.
(b) Total non-potable demand (AFY) calculated by multiplying the application rate (2.63 ft per year) by the irrigable acreage.
(c) Total non-potable demand (AFY) including the ECS system application rate (1.52 ft per year) for the Santa Lucia middle school, future elementary school, and future community park. An application rate of 2.63 ft per year was used for all other users.

8.6.2 Water Quality

The quality of the additional potable water available as a result of the use of recycled water would be excellent, as it would consist of water from the current groundwater sources.

8.6.3 Required Infrastructure

As identified in the Kennedy/Jenks report entitled, “Task 3: Recycled Water System Modeling,” 2004, approximately 25,000 ft of 6 to 12-inch ductile iron pipeline with purple polyethylene wrapping would be required to distribute the recycled water to the potential irrigation users. Figure 4-5 provides a map of the proposed distribution system pipeline.

There are two pump stations required for this alternative. The first pump station would be located at the WWTP and would convey highly treated recycled water from the treatment plant to the northern pressure zone and reservoir. The lower pump station would withdraw water from a refurbished existing 400,000 gallon tank (a.k.a. the “Cantex tank”) at the wastewater plant that would serve as a clear well. For cost estimating purposes the pump station was sized to meet a peak hour demand of 375 gpm, but would have an overall capacity of 700 gpm to match peak hour demand in case of an emergency. The second pump station would boost water from the Zone 1 storage tanks to the southern pressure zone. It was designed to handle peak hour demand of 250 gpm and would have a hydropnuematic tank system for maintaining system pressure in the upper zone.

A 0.4 MG clear well would buffer the hourly demand peaks and accommodate one 24-hour period of maximum day demand (or 20-hours of maximum day demand and two peak demand events) in case of an emergency. Additionally, seasonal storage may need to be provided to ensure a No-Net Increase on basin demand. One potential seasonal storage option is the subterranean dam concept as discussed in Section 5.1.6.

In addition to the recycled water distribution system, the WWTP would need to be upgraded to provide tertiary treatment because the water is planned for unrestricted irrigation use at parks and schools. Tertiary treatment consists of coagulation/flocculation, sedimentation, filtration, and disinfection. Besides normal tertiary treatment, future detailed design study would need to consider applying nanofiltration for lowering TDS and advanced oxidation. The capacity of the tertiary treatment facility was sized to treat 0.5 MGD (max day demand). During the dry season, only 0.40 MGD would be available for tertiary treatment because 0.25 MGD of secondary treated water would be used at the District’s hydraulic mound.

8.6.4 Reliability

Recycled water is a reliable non-potable water source as wastewater is continuously generated and treated. Construction of the clear well tank and Zone 1 storage tanks would ensure reliability during peak hours and for short-term emergencies. In the event that the treatment plant could not provide adequately treated water over an extended outage, CCSD would be required to provide potable water to the users. However, irrigation systems have some resiliency to weathering short term outages when compared to the higher level of reliability commonly associated with potable systems.

8.6.5 Required Agreements/Institutional Issues

Agreements between CCSD and each of the potential recycled water users would be necessary. Because the list of users is limited and some properties are owned by CCSD, it should not be difficult to obtain these agreements. A discount to the users may be necessary as an incentive to utilize the non-potable source.

8.6.6 Environmental Issues

Revegetation would be required along the distribution system pipeline route. Environmental issues at the reservoir location are expected to be short-term and reduced with mitigation measures because the proposed site is currently vacant land. Further study is also needed to assess potential impacts to groundwater quality due to increased levels of TDS and the potential for trace pharmaceuticals and other non-regulated chemicals of concern that may emerge as regulations evolve. For this reason, the use of nanofiltration for TDS removal and advanced oxidation should also be considered. No other major environmental concerns are expected, as this alternative would not likely involve any changes to stream-flow or land use.

8.6.7 Permitting/CEQA

Required permits include encroachment permits for the pipeline construction. NPDES and Title 22 permits would also need to be obtained from the RWQCB.

Preparation of the necessary CEQA documentation would also be required.

8.6.8 Costs/Funding

The total capital cost for this alternative would include the costs for the required recycled water distribution system and the cost for the WWTP upgrades. Table 8-24 provides a summary of the capital cost associated with the recycled water system alternative.

TABLE 8-24
ESTIMATED CAPITAL COSTS (2002) FOR RECYCLED WATER

Description of Cost	Cost
Pipeline	$1,414,000
Pump Stations	$429,000
Reservoir	$58,000
Treatment Plant	$1,500,000
Seasonal Storage	$600,000
Subtotal	$4,001,000
Contingency[a]	$1,200,000
Engineering/Legal[b]	$600,000
Total	$5,801,000

Notes:
(a) Evaluated at 30 percent.
(b) Evaluated at 15 percent.

Annual O&M costs were estimated by evaluating power costs, parts costs, and labor costs. Table 8-25 provides a summary of the total annual O&M costs.

TABLE 8-25
ESTIMATED O&M COSTS (2002) FOR RECYCLED WATER

Description of Cost	Cost
Fixed O&M Costs:	
Pipeline[(a)]	$1,500
Pump Station[(b)]	$4,300
Reservoir[(a)]	$100
Seasonal Storage[(a)]	$600
Labor[(c)]	$26,500
Total Fixed ($/Yr)	$33,000
Variable O&M Costs:	
Treatment costs[(d)]	$408
Power costs[(e)]	$405
Total Variable ($/AF)	$812

Notes:
(a) Evaluated at 0.1 percent of capital cost.
(b) Evaluated at 1.0 percent of capital cost.
(c) Evaluated at 3 hrs/day at $34/hr, including benefits, and 260 days a year.
(d) Evaluated at 5.0 percent of capital cost, including chemical cost.
(e) Evaluated using an electricity rate of $0.15/kW-hr and 365 days of operation. This includes the power cost for both pump stations. A pump efficiency of 80 percent and a motor efficiency of 90 percent were assumed.

Table 8-26 provides a cost summary for this alternative. The total annual fixed cost is $369,000 and the total variable cost is $810 per AF.

TABLE 8-26
COST SUMMARY (2002) FOR RECYCLED WATER

Supply	Capital Costs	Annual Capital Cost[(a)]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)[(b)]
160 AFY	$5,801,000	$336,000	$33,000	$369,000	$810

Notes:
(a) Calculated using a 4 percent interest rate and a 30-year life span.
(b) Rounded to the nearest $10/AF.

Both the federal and state governments have policies to encourage recycled water projects. These policies have led to several grant and low interest loan programs. Available funds for grants and low interest loans are dependent upon legislative approval and available monies. Funding may be available from the following sources:

- U.S. Bureau of Reclamation
- State Water Resources Control Board (SWRCB)
- California Department of Water Resources (DWR)

8.6.8.1 U.S. Bureau of Reclamation

The U.S. Bureau of Reclamation's water reclamation and reuse grant program was developed via the Reclamation Wastewater and Groundwater Study and Feasibility Act of 1992 (Title XVI of Public Law [P.L.] 102-575, as amended). This program investigates and identifies opportunities for reclamation and reuse of municipal, industrial, domestic, and agricultural wastewater, and naturally impaired ground and surface waters, for the design and construction of demonstration and permanent facilities to reclaim and reuse wastewater, and to conduct research, including desalting, for the reclamation of wastewater and naturally impaired ground and surface water. The Act also provides a program for federal participation (through cost sharing) of specific water reuse projects up to certain amounts specified in the Act. Construction funds can be provided only for projects specifically authorized by Congress pursuant to Title XVI.

8.6.8.2 State Water Resources Control Board

The March 2000 approval of Proposition 13 (2000 Water Bond) provided funds to be allocated by SWRCB for local water-related projects. Roughly $763.9 million was allocated to be available through various bond programs.

The Water Recycling Financial Assistance Program provides grants and low-interest loans for design and construction of water recycling facilities, grants for water recycling facilities planning studies, and grants for recycling research and studies. A total of $53.2 million is available for grants for construction of facilities, $49.5 million in loans for facilities and grants for planning, and $3.2 million for research and studies. The program provides both low-interest loans and grants to local agencies to construct water recycling facilities, provides grants up to $75,000 to local agencies for planning of water recycling facilities, and provides funds for research and studies. Proposition 13 rolls the funds for water recycling from the 1988 Bond Law and 1996 Bond Law into a new Proposition 13 subaccount. The 1984 Bond Law remains separate, provides low-interest loans up to $10 million for design and construction of facilities, and has no geographic restrictions. Loan applications are supported by facilities planning report demonstrating that the proposed project is cost effective. Loans may be for a period of up to 20 years with an interest rate of 50 percent of the interest rate paid by the state on the most recent sale of State General Obligation Bonds. There is a $15 million limit per project on loans.

The Infrastructure State Revolving Fund Program provides low-cost financing to public agencies in amounts ranging from $250,000 to $20,000,000, with a term of up to 30 years. This program supports a variety of projects, including water treatment and distribution.

8.6.8.3 California Department of Water Resources

DWR has several grant programs available to assist in funding local studies, programs, and projects to better manage California's water resources. It is the primary intent of these programs to fund local activities that will enhance water supply reliability and increase the beneficial use of existing supplies.

The Proposition 13 Water Conservation Program provides low interest loans and grants for construction projects, and grants for feasibility studies to public agencies and incorporated mutual water companies. The Proposition 204 Local Projects program provides low interest loans and grants to local public agencies for water supply construction projects and feasibility studies. The Proposition 82 Local Water Supply program provides only loans for construction projects and feasibility studies.

The Urban and Agricultural Water Conservation Program provides loans to public agencies, and incorporated mutual water companies to finance feasible, cost effective water conservation projects or programs to improve water use efficiency. Projects involving construction of recycled water distribution systems for reuse in lieu of existing potable water supplies are eligible for funding under this program.

The Local Water Supply Construction Loan Program provides loans for the construction of water reclamation facilities to communities for the purpose of supplying additional new local water supplies. Construction of water reclamation storage and distribution facilities, as well as the purchase of land and land easements, is eligible for funding. The maximum loan is $5 million and the interest rate is equal to the most recent California General Obligation Bond sale.

8.6.9 Schedule

Negotiations for this alternative should be relatively straightforward and take approximately 6 months. Permitting, design, construction, and startup are likely to require an additional 2 to 3 years to complete.

8.7 Demand Management

Demand management would consist of improvements to the current conservation program and regulations to reduce potable water use for landscaping. Although CCSD's current conservation practices have already reduced the average per capita potable water consumption below the state average, more efficient water demand management practices were investigated for further reduction in water consumption.

CCSD currently has a Water Conservation and Retrofit Program. Under the current Retrofit Program, construction of new homes and the resale of old homes require retrofitting other homes with the following fixtures:

- Toilets: Ultra low flow 1.6 gallons per flush maximum
- Urinals: 1 gallon maximum, flushometer positive pressure type
- Showerheads with shutoff valve: 2.0 gpm maximum
- Lavatory Faucets: 0.5 gpm maximum
- Kitchen Faucets: 2.0 gpm maximum
- Outside hosebib/vacuum breaker: 4.0 gpm maximum at 50 psi
- Pressure Regulators: 50 psi with a rated capacity of at least 300 psi
- For parcels of 8,000 ft^2 and greater, cisterns[30]: minimum 3,000 gallons

The number of homes that must be retrofitted is determined by a point system dependent upon the number of bathrooms and the size of the parcel of the new home. For example, a new home with a parcel size of 4,001 to 8,000 square feet and 2 bathrooms would require 13 retrofit points. Table 8-27 provides a summary of the number of points required for residential construction.

[30] Cistern is a storage tank used to store collected rainwater.

TABLE 8-27
NUMBER OF RETROFIT POINTS REQUIRED

Parcel Size (square feet)	1 Bath (3 pts)	2 Baths (6 pts)	3 Baths (10 pts)	4 Baths (14 pts)	5 Baths (18 pts)
Under 4,000 (4 pts)	7	10	14	18	22
4,001-8,000 (7 pts)	10	13	17	21	25
8,001-16,000 (10 pts)	13	16	20	24	28
16,001-32,000 (13 pts)	16	19	23	27	31
Over 32,000 (18 pts)	21	24	28	32	36

Source: Ordinance No. 4-99.

Each retrofit point is equivalent to either a full retrofit of a two-bathroom house or a fee of $550. A full retrofit includes the installation of all the required fixtures listed above plus a hot water recirculation system. Other important point conversions are as follows:

- Each 1-Bathroom house: 0.8 pt
- Each 2-Bathroom house: 1.0 pt
- Each 3-Bathroom house: 1.4 pts
- Each 4-Bathroom house: 1.75 pts
- Each additional bathroom: 0.25 pt
- Small Commercial/Retail: 0.8 pt
- Hot Water Recirculation: 0.5 pt
- Cistern: 8.18 pts (maximum)

For this example, the 13 pts required could be meet by paying an in lieu fee of $7,150 or retrofitting a combination of homes. A full retrofit of a 1-bathroom house would be equivalent to 1.3 pts (0.8 + 0.5) whereas a full retrofit of a 3-bathroom house would be equivalent to 1.9 pts (1.4 + 0.5). Thus, the 13 pts could be met with the following combination one 1-bathroom house, three 3-bathroom houses, and four 2-bathroom houses. (1*1.3 + 3*1.9 + 4*1.5 = 13)

To further reduce water consumption, a tiered water rate structure is utilized. Although CCSD has water rates higher than surrounding communities, customers using twice the amount of water are only paying about 70 percent more.

The following restrictions have been placed on external use to prevent wasting of potable water:

- No excess water run-off.
- No unattended watering.
- No watering between 10:00 a.m. and 6:00 p.m.
- Water use limited to amount necessary to maintain landscaping.
- No washing of sidewalks, driveways, or the like.
- Water must be shut-off within 2 hours of leak detection.
- No water served unless requested.
- Use of bucket to wash car and rinse using hose with shutoff value.
- No compacting or dust control using potable water.

- No unmetered use not for fire suppression from any fire hydrant.
- No tampering or removal of water meters.

Most of these restrictions have been in place since 1991, however, a violation fee program was implemented in 2000 to further deter excessive external potable water use. Under Ordinance No. 4-2000, violation of these restrictions results in a $50 fine for the first violation, $150 for the second, $250 for the third, and $1,000 for each subsequent violation within a 12-month period. Failure to pay fines may result in termination of water service.

In 2000, CCSD also revised their Water Conservation Program (Ordinance 3-2000) consisting of three stages of water use restrictions. Stage 1 is the drought watch condition; Stage 2 is the water shortage condition; and Stage 3 is a water shortage emergency. Each stage has varying levels of water use restrictions and violation consequences and are determined based on projected groundwater levels using the model developed in the 2000 report entitled, "Baseline Water Supply Analysis." CCSD is currently in Stage 3, which utilizes a modification to the water rate structure. Table 8-28 provides a summary of the water use restrictions for each stage.

TABLE 8-28
WATER CONSERVATION PROGRAM

	Stage 1	Stage 2	Stage 3
Public Use	Reduce landscape irrigation and encourage non-potable use.	Eliminate irrigation use for decorative landscape and reduce irrigation use for play areas and turf.	Maximum Allotment: 3 units[(a)]/EDU[(b)]/month.
Commercial Use	Maximum Allotment: < 5 units/EDU/month or actual monthly average, which ever is lower	Maximum Allotment: < 5 units/EDU/month or actual monthly average, which ever is lower.	Maximum Allotment: < 3 units/EDU/month or actual monthly average, which ever is lower.
Residential Use	Maximum Allotment: 3 units/permanent resident/ month	Maximum Allotment: 3 units/permanent resident/ month	Maximum Allotment: 2 units/permanent resident/month.
Landscape Use	New landscaping limited to native or drought tolerant plants.	New landscaping limited to native or drought tolerant plants.	No landscape irrigation with potable water.
Water Rate Schedule	No change	No change	First tier will be shortened from 6 units to 4 units.
Violations	None	500 percent surcharge for first violation 1,000 percent surcharge for all subsequent violations A delinquent bill may be increased by 10 percent and after 10 days service may be disconnected.	500 percent surcharge for first violation 1,000 percent surcharge for all subsequent violations A delinquent bill may be increased by 10 percent and after 10 days service may be disconnected.

Notes:
(a) Unit = 748 gallons of water (100 cubic feet).
(b) EDU = equivalent dwelling unit.
Source: Ordinance 3-2000.

Modifications that can still be made to the existing demand management practices include:

1. Addition of front-loading washers to the Retrofit Program, either as a required full retrofit fixture or credit as an additional unit as opposed to just promoting their use as proposed in the 1999 report. Front-loading washers have been found to use half the volume of top-loading washers.

2. Meter replacement as part of the Retrofit Program[31]. Meters lose accuracy over time; testing and replacement would improve meter efficiency and should reduce the overall unaccounted for water consumption.

[31] Proposed by Boyle Engineering Corporation. 1999. Water Conservation and Reuse Study.

3. Addition of rain sensors to the Retrofit Program as a required full retrofit fixture. Rain sensors would allow for irrigation systems to shut-off during periods of rain. They are cheaper and easier to maintain than the moisture sensors proposed by the 1999 report, which tend to be problematic.

8.7.1 Water Supply Capabilities

The supply capabilities associated with this alternative would be determined by the reduction in potable water use. Because CCSD currently has already implemented extensive conservation practices, the potential for further reduction is low. Accordingly this alternative is not expected to provide sufficient water supply to meet any of the four projected water demand scenarios.

8.7.2 Water Quality

Water demand management would not have any water quality implications. It would simply allow available water to be used more efficiently. Thus, the overall water quality is considered excellent.

8.7.3 Required Infrastructure

No significant additional infrastructure would be required for this alternative.

8.7.4 Reliability

Water demand management is largely dependent upon voluntary actions by water customers. While CCSD can make information available and develop a favorable climate for water conservation compliance, there is no assurance that the public will participate. Accordingly, the quantity of water conserved is difficult to determine.

8.7.5 Required Agreements/Institutional Issues

No agreements with external entities would be necessary to implement a Demand Management alternative. However, modifications to the existing ordinance would be required.

8.7.6 Environmental Issues

No environmental issues are anticipated for this alternative.

8.7.7 Permitting/CEQA

No permits or CEQA documentation would be required for this alternative.

8.7.8 Costs/Funding

This alternative should only involve administration costs for the approval of the modified ordinance. CCSD could use the in lieu fees to fund any other costs that may arise.

8.7.9 Schedule

Conservation practices could start immediately after the modifications are approved.

8.8 San Simeon Dam and Reservoir – Van Gordon Site

This alternative would involve the construction of a dam located on the east tributary of Van Gordon Creek. The reservoir would store the remaining wet season groundwater entitlement from both basins for recharge during the dry season. The water would be released into San Simeon Creek where it would recharge the groundwater basin. This alternative was previously discussed in "Comparative Analysis of Potential Long-Term Water Supply Projects for the District," prepared by Engineering-Science, Inc. dated 1991. (1991 report)

8.8.1 Water Supply Capabilities

This alternative is expected to store 700 AF from the San Simeon Basin and Santa Rosa Basin. However, in the future when wet season demand increases, only 200 AF from both basins would be available for storage. This amount will not be sufficient to meet projected water demand for any of the four scenarios particularly when losses from evaporation, evapotranspiration, and transit are considered. The reservoir would be designed to store up to 1,000 AF, to allow for additional supply from unused portions from previous years when demands are low. Thus, this alternative is expected to meet the demands for one of the projected scenarios (Scenario 4) with the 50 percent quality of life increase.

8.8.2 Water Quality

This alternative would utilize the same existing water sources, but would involve mixing water from the two groundwater basins. Although a difference in water quality between the two basins exists, the Santa Rosa water would have already been treated for iron and manganese and thus should not compromise the water quality at the San Simeon well field.

8.8.3 Required Infrastructure

This alternative would consist of the construction of a dam and reservoir, 6,000 ft of 8-inch pipeline, and a pump station.

The dam would be 60 ft high with a crest length of 800 ft. A straight chute in the right abutment would provide spillway into Van Gordon Creek. 30 ft of bottom excavation would be required. The dam would have a spillway capacity of approximately 3,000 cfs and 5 ft of gross freeboard. The expected reservoir depth is 55 ft.

An 8-inch pipeline from the well fields to the reservoir would be required to convey the pumped groundwater to the reservoir. Releases from the dam would back-flow through this pipeline to the well field at San Simeon Creek. From there, a valve system would route the water past the well field to an additional 8-inch pipeline, which would convey the water to the recharge point in San Simeon Creek. Total pipeline length would be 6,000 ft. Santa Rosa groundwater would be conveyed to the San Simeon well field thru CCSD's existing distribution system and then to the reservoir in the same manner as San Simeon groundwater.

An 880 gpm pump station would be required to pump excess groundwater from the San Simeon well field to the reservoir during the wet season. One-hundred (100) hp would be required to overcome the 165 ft of head and 150 ft of friction losses.

8.8.4 Reliability

The dam site for this alternative would provide both structurally and hydrologic reliability. The proposed dam site is located in geological stable environment and thus is considered structurally reliable. Furthermore, the dam is considered more reliable than the other proposed dams because it is not dependent upon collection of run-off and rainfall. The groundwater sources utilized in this alternative have already been established to ensure future availability, increasing the reliability. However, this alternative is still restricted by available wet season supply. Therefore, if the basin is not fully recharged, a limited amount would be available for storage. Accordingly, supply from this alternative will be limited when demand is highest (i.e. critically dry water years).

8.8.5 Required Agreements/Institutional Issues

Required agreements for this alternative include obtaining right-of-way for the dam and reservoir and right-of-way for the pipeline route. Minimal difficulties are expected to obtain the required right-of-ways.

8.8.6 Environmental Issues

This alternative would include many of the same environmental concerns associated with most dam and reservoir projects. The reservoir site consists of 40-acres of non-native grasses used for grazing, approximately 3,500 ft of intermittent stream channel, and a band of willows, all of which would be lost as a result of the reservoir. However, the Southwestern Pond Turtle and Red Legged Frog were not found in the area during previous biological resource surveys. Mitigation measures would most likely include off-site replacement of lost habitat.

Of particular concern is the impact to downstream lagoons, which support several threatened and endangered species including Red Legged Frog, Southwestern Pond Turtle, and Tidewater Goby. Releases from the reservoir would need to maintain minimal water levels and limit salinity levels in the lagoon.

Revegetation would most likely be required along the pipeline routes.

A survey of the known Native American Indian mortar holes, used for grinding, located near the right abutment would be required and the appropriate mitigation measures taken to reduce impacts to cultural resources.

8.8.7 Permitting/CEQA

For this alternative, several permits would be required. Table 8-29 provides a complete list of the permits required for this alternative. A few of the more difficult permits to obtain are discussed below.

CCSD must obtain an NPDES permit for the discharge/recharge to San Simeon Creek as required by the RWQCB. Additionally, a construction NPDES permit would be required for this alternative. BMPs such as erosion control and dust control would be required during construction. Extensive re-vegetation along the pipeline route would also be required.

Additionally, an alteration to the existing diversion permit at San Simeon Creek from SWRCB would be required for the increased dry season pumping. Similarly, an alteration to the existing diversion permit at Santa Rosa Creek would be required for the diversion to the reservoir site. Adjustments must also be made for the right to store the water from both basins at the reservoir site. The revised permits should address any changes in the maximum rate of diversion, maximum annual diversion, and maximum dry season diversions.

A Section 106 Review permit may be required from the State Historic Preservation Office because Native American Indian archaeological sites are known to be near the proposed location of the right abutment. If identified during final design or construction, these areas should be avoided or built around.

An EIR is most likely required to meet CEQA requirements.

TABLE 8-29
LIST OF REQUIRED PERMITS FOR THE SAN SIMEON DAM AND RESERVOIR-VAN GORDON SITE

Agency	Permit Description	Permit Jurisdiction
Local Permits		
County of SLO, Public Works Department	Encroachment Permits and Grading Permits	Required for work with road right-of-way; grading activities
County of SLO, Building and Planning Department	Land Use Permit	Required for changes in land use
State Permits		
California Regional Water Quality Control Board	National Pollutant Discharge Elimination System Permit (NPDES)	Required for discharge to watershed
California Regional Water Quality Control Board	Storm Water NPDES	Required for construction activities; storm water discharge
State Water Resources Control Board	Permit for Diversion and Use of Water	Required for diversion from groundwater basin
Department of Fish and Game	Stream or Lake Alteration Agreement	Required for activities in rivers, streams, or lakes
Department of Water Resources, Division of Safety of Dams	Approval of Plans	Required for all activities involving dams or reservoirs.
Federal Permits		
U.S. Army Corps of Engineers	Section 404	Required for projects affecting wetlands, inland waters, lakes, rivers, etc.
U.S. Fish and Wildlife	Fish and Wildlife Coordination Act Section 10 (a) Permit Endangered Species Act	Required for stream crossings; conservation of endangered species
State Historic Preservation Office	Section 106 Review	National Historic Preservation Act of 1966

8.8.8 Costs/Funding

The total capital cost for this alternative would include the construction costs for the dam and reservoir, pipeline, and pump station. Right-of-way costs for the facilities are included in the capital cost for the facilities. Table 8-30 provides a summary of the capital cost associated with the San Simeon Dam – Van Gordon Site alternative.

TABLE 8-30
ESTIMATED CAPITAL COSTS (2002) FOR THE SAN SIMEON DAM AND RESERVOIR–VAN GORDON SITE

Description of Cost	Cost[a]
Dam/Reservoir	$5,656,000
Pipeline	$270,000
Pump Station	$41,000
Subtotal	$5,967,000
Contingency[b]	$1,790,000
Engineering/Legal[c]	$895,000
Total	$8,652,000

Notes:
(a) Source: Engineering-Science, Inc., "Comparative Analysis of Potential Long-Term Water Supply Projects for the District," 1991.
(b) Evaluated at 30 percent.
(c) Evaluated at 15 percent.

Fixed annual and variable O&M costs were estimated by evaluating power costs, parts costs, and labor costs. Table 8-31 provides a summary of the estimated O&M costs.

TABLE 8-31
ESTIMATED O&M COSTS (2002) FOR THE SAN SIMEON DAM AND RESERVOIR–VAN GORDON SITE

Description of Cost	Cost
Fixed O&M Costs:	
Dam/Reservoir[a]	$6,000
Pipeline[a]	$300
Pump Station[b]	$400
Labor[c]	$53,000
Total Fixed ($/Yr)	$59,000
Variable O&M Costs:	
Power costs[d]	$98
Total Variable ($/AF)	$98

Notes:
(a) Evaluated at 0.1 percent of capital cost.
(b) Evaluated at 1.0 percent of capital cost.
(c) Evaluated at 6 hrs/day at $34/hr, including benefits, and 260 days a year.
(d) Evaluated using an electricity rate of $0.15/ kW-hr and 181 days of operation. A pump efficiency of 80 percent and a motor efficiency of 90 percent were assumed.

Table 8-32 provides a cost summary for this alternative. The total annual fixed cost is $559,000 and the total variable cost is $100 per AF.

TABLE 8-32
COST SUMMARY (2002) FOR SAN SIMEON DAM AND RESERVOIR–VAN GORDON SITE

Supply	Capital Costs	Annual Capital Cost[(a)]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Cost ($/AF)[(b)]
700 AFY	$8,652,000	$500,000	$59,000	$559,000	$100

Notes:
(a) Calculated using a 4 percent interest rate and a 30-year life span.
(b) Rounded to the nearest $10/AF.

Both federal and state governments have policies to encourage water projects involving recharge. These policies have led to several grant and low interest loan programs. Available funds for grants and low interest loans are dependent upon legislative approval and available monies. CCSD may be able to obtain a low interest loan for construction of this alternative through the Department of Water Resources Proposition 13. Proposition 13 supports construction projects involving recharge facilities to increase supply reliability. No more than $5 million will be awarded to a single project and cost-shared projects will receive priority.

8.8.9 Schedule

Completion of an EIR is likely to take more than one year. Permitting, design, construction, and startup are likely to require an additional 2 to 3 years.

8.9 Jack Creek Dam and Reservoir

This alternative would involve the construction of a dam located on Jack Creek. The reservoir, with a storage capacity of 4,705 AF, would collect run-off from the Dover Canyon watershed during the wet season. Releases would be made during the dry season to Santa Rosa Creek for recharge of the groundwater basin. This alternative was previous discussed in, “Comparative Analysis of Potential Long-Term Water Supply Projects for the District,” prepared by Engineering-Science, Inc. dated 1991. (1991 report)

8.9.1 Water Supply Capabilities

This alternative was designed to supply 700 AFY, which is considered sufficient to meet future total and dry season demand for one of the projected scenarios (Scenarios 4) with the 50 percent quality of life increase, when used in conjunction with the existing groundwater sources.

8.9.2 Water Quality

The source of water for this alternative is run-off from the Dover Canyon watershed, which has an area of five square miles and an average rainfall of 31 inches. Dover Canyon watershed is a part of the Salinas River Watershed. After collection and storage, the water would be used to recharge the Santa Rosa Basin.

Because this alternative utilizes groundwater from the Santa Rosa Basin, treatment for iron and manganese and disinfection would be required. The addition of a packaged filtration and chlorination plant would be sufficient to meet treatment requirements.

8.9.3 Required Infrastructure

This alternative would require construction of a dam, reservoir, pump station, pipeline, two new extraction wells, and a treatment facility.

An earth filled dam approximately 95 ft high with a crest length of 700 ft would need to be constructed. Approximately 15 ft of bottom excavation would also be required. The dam is expected to have a spillway capacity of 12,500 cfs and 10 ft of gross freeboard. The reservoir depth is expected to be 80 ft. Minimal slope stabilization would be required at the dam site.

A 567 gpm pump station would be required to pump the release over the divide and into Santa Rosa Creek. With a 1,000 ft of elevation and 189 ft of line losses, a total of 225 hp would be required. It is anticipated that the pump station would operate 300 days per year.

The pipeline route would consist of 17,000 ft of 8-inch pipeline from the reservoir site over the divide to the release point at Santa Rosa Creek. Construction of the pipeline route is expected to be difficult, due to the steep terrain through landslide sensitive area.

Two new extraction wells in the Santa Rosa Basin would be required to pump the increased supply. A packaged filtration and chlorination plant would also be constructed.

8.9.4 Reliability

The dam site for this alternative provides both structurally and hydrologic reliability. The proposed dam site is located in geological stable environment and thus is considered structurally reliable. Because this alternative is dependent upon rainfall, during drier periods a reduction in pumping may be required. The revised diversion permit should provide restrictions in pumping to ensure hydrologic reliability. Precaution must be taken in the final planning of the pipeline route to avoid the sensitive landslide areas known to exist near the proposed pipeline route.

8.9.5 Required Agreements/Institutional Issues

There are a few agreements that must be made for this alternative.

Because Dover Canyon is part of the Salinas River Watershed, which has been over appropriated, all natural flow from Dover Canyon must be released to Jack Creek during the dry season.

Also right-of-way for the dam and reservoir site as well as the pipeline route would be required. However, because most of the land is private property, right-of-way may be difficult to obtain.

8.9.6 Environmental Issues

This alternative would involve numerous environmental issues.

Approximately 160 acres of coast live oak, chaparral, and non-native grasses would be lost as a result of the dam and reservoir. These losses are considered significant and replacement of habitat would be a required mitigation measure. Another significant impact is the loss of 16,500 ft of stream channel at the reservoir site.

Although species-of-special-concern were not found at the proposed dam site, they are known to exist downstream of the proposed dam site. The regulated releases, as required during the dry season, would minimize impacts to these sensitive species. Special releases may also be required to minimize impacts to fish migration.

No species of special concern were found along the pipeline route, but a more detailed biological study should be conducted after the route has been finalized. Short-term impacts with mitigation measures available, such as revegetation, are expected for the pipeline route.

8.9.7 Permitting/CEQA

For this alternative, several permits would be required. Table 8-33 provides a complete list of the permits required for this alternative. A few of the more difficult permits to obtain are discussed below.

CCSD must obtain an NPDES permit for the discharge/recharge to Santa Rosa Creek as required by the RWQCB. Additionally, a construction NPDES permit would be required for this alternative. BMPs, such as erosion control and dust control, would be required during construction. Extensive re-vegetation along the pipeline route would also be required.

Additionally, an alteration to the existing diversion permit at Santa Rosa Creek from SWRCB would be required for the diversion to the reservoir and for the increased dry season pumping. Adjustments must also be made for the right to store the water at the reservoir site. The revised permit should address any changes in the maximum rate of diversion, maximum annual diversion, and maximum dry season diversions.

An EIR is most likely required to meet CEQA requirements.

TABLE 8-33
LIST OF REQUIRED PERMITS FOR THE JACK CREEK DAM AND RESERVOIR

Agency	Permit Description	Permit Jurisdiction
Local Permits		
County of SLO, Public Works Department	Encroachment Permits and Grading Permits	Required for work with road right-of-way; grading activities
County of SLO, Building and Planning Department	Land Use Permit	Required for changes in land use
State Permits		
California Regional Water Quality Control Board	National Pollutant Discharge Elimination System Permit (NPDES)	Required for discharge to watershed
California Regional Water Quality Control Board	Storm Water NPDES	Required for construction activities; storm water discharge
State Water Resources Control Board	Permit for Diversion and Use of Water	Required for diversion from groundwater basin
Department of Fish and Game	Stream or Lake Alteration Agreement	Required for activities in rivers, streams, or lakes
Department of Water Resources, Division of Safety of Dams	Approval of Plans	Required for all activities involving dams and reservoirs.
Federal Permits		
U.S. Army Corps of Engineers	Section 404	Required for projects affecting wetlands, inland waters, lakes, rivers, etc.
U.S. Fish and Wildlife	Fish and Wildlife Coordination Act Section 10 (a) Permit Endangered Species Act	Required for stream crossings; conservation of endangered species

8.9.8 Costs/Funding

The total capital cost for this alternative would include the construction costs for the dam and reservoir, pipeline, and pump station. Table 8-34 provides a summary of the capital cost associated with the Jack Creek Dam alternative.

TABLE 8-34
ESTIMATED CAPITAL COSTS (2002) FOR THE JACK CREEK DAM AND RESERVOIR

Description of Cost	Cost[(a)]
Dam/Reservoir	$4,535,000
Pipeline	$852,000
Wells	$96,000
Pump Station	$98,000
Treatment Plant	$178,000
Subtotal	$5,759,000
Contingency[(b)]	$1,728,000
Engineering/Legal[(c)]	$864,000
Total	$8,351,000

Notes:
(a) Source: Engineering-Science, Inc., "Comparative Analysis of Potential Long-Term Water Supply Projects for the District," 1991.
(b) Evaluated at 30 percent.
(c) Evaluated at 15 percent.

Fixed annual and variable O&M costs were estimated by evaluating power costs, parts costs, and labor costs. Table 8-35 provides a summary of the estimated O&M costs.

TABLE 8-35
ESTIMATED O&M COSTS (2002) FOR THE JACK CREEK DAM AND RESERVOIR

Description of Cost	Cost
Fixed O&M Costs:	
Dam/Reservoir[(a)]	$5,000
Pipeline[(a)]	$900
Wells[(a)]	$100
Pump Station[(b)]	$1,000
Labor[(c)]	$97,000
Total Fixed ($/Yr)	$104,000
Variable O&M Costs:	
Treatment Plant	$5
Power costs[(d)]	$196
Total Variable ($/AF)	$201

Notes:
(a) Evaluated at 0.1 percent of capital cost.
(b) Evaluated at 1.0 percent of capital cost.
(c) Evaluated at 11 man-hrs/day at $34/hr, including benefits, and 260 days a year.
(d) Evaluated using an electricity rate of $0.15/ kW-hr and 181 days of operation. A pump efficiency of 80 percent and a motor efficiency of 90 percent were assumed.

Table 8-36 provides a cost summary for this alternative. The total annual fixed cost is $587,000 and the total variable cost is $200 per AF.

TABLE 8-36
COST SUMMARY (2002) FOR THE JACK CREEK DAM AND RESERVOIR

Supply	Capital Costs	Annual Capital Cost[(a)]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Cost ($/AF)[(b)]
700 AFY	$8,351,000	$483,000	$104,000	$587,000	$200

Notes:
(a) Calculated using a 4 percent interest rate and a 30-year life span.
(b) Rounded to the nearest $10/AF.

Both federal and state governments have policies to encourage water projects involving recharge. These policies have led to several grant and low interest loan programs. Available funds for grants and low interest loans are dependent upon legislative approval and available monies. CCSD may be able to obtain a low interest loan for construction of this alternative through the Department of Water Resources Proposition 13. Proposition 13 supports construction projects, which involve recharge facilities to increase supply reliability. No more than $5 million will be awarded to a single project and cost-shared projects will receive priority.

8.9.9 Schedule

Completion of an EIR is likely to take more than one year. Permitting, design, construction, and startup are likely to require an additional 2 to 3 years.

8.10 Comparison of Water Supply Alternatives

The potential long-term water supply alternatives were evaluated according to the following criteria:

- Water Supply Capabilities: ranked from < 600 AFY to 1,000 AFY
- Water Quality: ranked from Very poor to Excellent
- Reliability: ranked from None to More than Sufficient
- Required Agreements/Institutional Issues: ranked from Very Difficult to None Required
- Environmental Issues: ranked from Significant to None
- Permitting/CEQA: ranked from Very Difficult to None Required
- Cost: ranked as a combination of annual and variable costs from above average to below average
- Funding: ranked from None to Fully funded

Table 8-37 compares the evaluation for each of the alternatives discussed in this section and is based on the assumption that each criterion has equal weight. Alternatives with a score of 2.9 or higher were considered viable options for CCSD. Accordingly, CCSD should consider continuing Demand Management and incorporating Recycled Water to reduce potable water demand in addition to implementing Seawater Desalination as a supplemental source during critically dry years. Because changes to the criterion weight may alter the final scores, alternatives with a score between 2.5 and 2.9 may also be considered.

TABLE 8-37
EVALUATION MATRIX FOR POTENTIAL WATER SUPPLY ALTERNATIVES

Alternatives	Supply Capabilities	Water Quality	Reliability	Required Agreements	Environmental Issues	Permitting/ CEQA	Cost Combination	Funding Availability	Total
Weight factor	*0.125*	*0.125*	*0.125*	*0.125*	*0.125*	*0.125*	*0.125*	*0.125*	*1*
Seawater Desalination									
RO-300 gpm	1	1	5	2	3	2	4	4	2.8
RO-600 gpm [(a)]	2	1	5	2	3	2	3	4	2.8
RO-900 gpm	4	1	5	2	3	2	3	3	2.9
Lake Nacimiento									
Town Creek- I ps, vt pumps	2	4	2	2	2	3	2	1	2.3
Franklin Creek- 1 ps, vt pumps	2	4	2	2	2	3	2	1	2.3
Town Creek- 3 ps, pd pumps	2	4	2	2	2	3	2	1	2.3
Franklin Creek- 3 ps, pd pumps	2	4	2	2	2	3	2	1	2.3
Whale Rock Exchange									
700 AFY	2	3	2	1	3	4	4	1	2.5
1,000 AFY	5	3	2	1	3	4	1	1	2.5
Hard Rock Drilling	1	3	3	3	1	3	4	1	2.4
Recycled Water [(a)]	1	1	5	4	3	3	5	3	3.1
Demand Mangagement [(a)]	1	5	3	3	5	5	5	4	3.9
San Simeon Dam- Van Gordon	2	2	1	2	2	3	5	2	2.4
Jack Creek Dam	3	2	2	1	1	3	5	2	2.4
definition of rank 1:	< 600 AFY	Very Poor	Not Reliable	Very Difficult	Significant	Very Difficult	Above Average	None Available	Poor
definition of rank 5:	> 1,000 AFY	Excellent	Very Reliable	None Needed	None	None Needed	Below Average	Fully Funded	Excellent

Note: (a) Recommended alternatives.