8.2 Alternatives Considered But Eliminated

This section discusses alternatives that were considered for the project or were reviewed as a result of scoping comments received, but were eliminated from further analysis as allowed under CEQA because they did not meet most of the project objectives; were found to be infeasible for technical, economic, environmental, or social reasons; or they did not substantially lessen or avoid a significant environmental effect of the proposed project. Many of these alternatives were considered by the City during the preparation of the *Integrated Water Plan* (IWP) (Gary Fiske & Associates, 2003) and related background studies, and/or by the District during the preparation of the draft *Integrated Resources Plan* (draft IRP) (Montgomery Watson, 1999), 2006 IRP (Environmental Science Associates, 2006), and the 2012 IRP Update (District, 2012a). See **Section 3, Project Background**, for additional information about the IWP and IRP planning processes.

As indicated in **Section 3**, the City and District have been pursuing possible new or supplemental water supplies – to meet the City's needs during drought periods; and to reduce the District's groundwater pumping so that the basin can recover.

Other water supply alternatives considered during the IWP and related background studies that have not been pursued by the City and are not evaluated in detail in this EIR include: various reclamation/recycled water alternatives, various groundwater alternatives, maximizing storage in Loch Lomond Reservoir, and reservoir storage in the Olympia Quarry (Gary Fiske & Associates, 2003; Carollo Engineers, 2000). Additionally, during planning that pre-dated the IWP process, other reservoir and groundwater alternatives were also evaluated.

Other water supply alternatives considered in the 1999 Draft IRP, 2006 IRP, and 2012 IRP Update, that are not currently being pursued by the District and are not evaluated in detail in this EIR include: a local-only desalination project serving only the District; Soquel Creek surface water diversion with off-stream storage; recharge enhancements; water import/groundwater banking with the PVWMA; small-scale recycled water facilities; and an on-stream reservoir (Glenwood) (Environmental Science Associates, 2006; District, 2012a).

It should be noted that there are a few instances where the water supply alternatives were evaluated for potential use for both the City and District, such as some of the reclamation / recycled water options below.

8.2.1 Groundwater Alternatives

Additional Groundwater Supply - City

The IWP provides an overview of all of the groundwater alternatives considered since the 1980s. The consulting firm of Luhdorff & Scalmanini was hired in 1987 to investigate possible ground water development potential in the North Coast Area, the Harvey West Park area, the DeLaveaga

golf course area, and on Thurber Lane. The conclusion of this groundwater investigation was that there was a lack of adequate supply from these sources. The City then hired CDM to prepare for the City a Water Supply Alternatives Study that reviewed the prior alternatives, and added several new alternatives. This study then grouped projects and created a system by which a Technical Advisory Committee would rate them on a number of weighted criteria to arrive at a single project (or group of projects) that was most feasible. The project that was rated most feasible was the Brackish Groundwater Wells project, which looked at the treatment of brackish groundwater in the Majors Creek area (Gary Fiske & Associates, 2003).

The City then hired Carollo Engineers in 1995 to perform all necessary work to design the Brackish Wells Project. Prior to any actual field work being performed (i.e. test well construction and pumping), this project encountered considerable resistance from area residents concerned that the test pumping could lead to a project that might harm their water wells. Because of this resistance, the Water Commission and City Council elected to abandon this effort. The technical feasibility of this project was never actually proven, as the test pumping data needed was not collected (Gary Fiske & Associates, 2003).

As part of the IWP process, the *City of Santa Cruz Alternative Water Supply Study* (Carollo Engineers, 2000) evaluated a number of groundwater alternatives:

- Brackish groundwater supply from wells in the San Lorenzo River Alluvial Plain near the mouth of the river.
- Fresh groundwater supply from wells in the San Lorenzo Alluvial Plain.
- Groundwater supply from the Purisima Aquifer near the Beltz wells.
- Groundwater supply from the Santa Margarita Aquifer near Wilder Ranch State Park and near downtown Santa Cruz.
- Groundwater supply near the Wilder Ranch gravel quarry.

These sources were evaluated alone and in combination to determine whether they could reliably meet the City's projected shortfalls during droughts. The primary constraints associated with the brackish and fresh groundwater from the San Lorenzo River alluvial plain included: (1) potential water rights issues given that the groundwater is likely hydraulically linked to the San Lorenzo River and may result in conflicts with the City's other water rights related to its Tait Street diversion; (2) potential impacts to riparian habitat from the lowering of groundwater levels, or by the introduction of more saline water into the shallow aquifer; (3) the potential that prolonged pumping could lead to seawater intrusion that could potentially affect the quality of water produced at the Tait Street Wells; and (4) the limited yield expected from these sources.

Carollo Engineers ultimately determined that all of the groundwater alternatives were not viable because groundwater sources are also affected during drought conditions and underground storage is not readily replenished. The analysis indicated that the maximum reliable yield from

the four combined groundwater sources noted above was estimated at 850 mgy. However, the actual amount available for supply on a reliable basis during drought conditions was estimated to be significantly less, in the range of 0 to 300 mgy (Carollo Engineers, 2000). Supply during drought conditions would be limited due to: (1) reduced natural recharge that would occur with little precipitation and infiltration; (2) coastal aquifers that do not have large storage capacities and therefore require regular recharge; (3) coastal aquifers that are "confined" so the rate/capacity of recharge is comparatively low; and (4) ongoing use of these aquifers by existing users. For example, the two biggest aquifers analyzed in the study (Santa Margarita aquifer near Wilder Ranch and Purisima aquifer) have existing users. The available (reliable) yield during a prolonged drought was determined to be uncertain because the yield from the aquifers will likely decrease as other users increase their reliance on this supply (Carollo Engineers, 2000). Further, and based on more recent information as described in **Section 3**, the Purisima is now in overdraft and therefore additional withdrawals from this aquifer by the City would not be considered viable.

Thus, while groundwater is potentially available in a limited quantity from some of the sources noted above, none of the groundwater resources, taken together or independently, could provide a significant portion of the projected drought demand shortfall. Additionally, there were other environmental, regulatory, and/or cost issues associated with some groundwater alternatives that would affect overall feasibility for implementation. Carollo Engineers concluded that the combination of constraints significantly limits the viability of groundwater as a drought supply alternative for the City and thus did not recommend that these alternatives be further pursued.

However, development of the Santa Margarita Aquifer in Live Oak was subsequently considered by the City in the IWP as a potential small source of supply that could be utilized in conjunction with either a downsized desalination facility or a downsized reclamation facility (Gary Fiske & Associates, 2003). The aquifer is below the Purisima aquifer from which the current Beltz wells draw supply. It assumed that this source would yield 100 mgy. The IWP documented that development of the Santa Margarita aquifer at Live Oak was found to not significantly improve performance against any IWP selection criterion and would increase hydrogeologic impacts related to depletion and the increased potential for seawater intrusion. In addition, the uncertainty of the magnitude of this supply results in the need for additional exploratory studies in order to evaluate the actual yield from this source. It was concluded that development of the Santa Margarita aquifer at Live Oak should not be undertaken as part of the IWP (Gary Fiske & Associates, 2003).

Based on the limitations and barriers listed above, this project was dropped from further consideration as part of the IWP process. For similar reasons, a project involving groundwater from any or all of the above sources would not meet any of the project objectives identified above as they relate to the City's services. Additionally, given the potential for hydrological impacts related to stream base flows and groundwater levels, a project involving any or all of the above sources would not address existing adverse groundwater conditions. Therefore, an

alternative involving groundwater supply development has been eliminated from further consideration in this EIR.

Recharge Enhancements with Precipitation - District

The District's 1999 draft IRP considered recharging the groundwater aquifer with precipitation through natural percolation. Under this alternative, storm water runoff would be captured and diverted to recharge basins where the water infiltrates into the aquifer. Based on existing Santa Cruz County hydrogeologic information, the areas designated effective for surface recharge within the Soquel-Aptos area are very limited, making this supplemental supply alternative infeasible. This alternative was eliminated from further consideration as a supplemental supply and was not further evaluated in the 2006 or 2012 IRPs (Environmental Science Associates, 2006; District, 2012a).

However, enhanced groundwater recharge is a component of the *Groundwater Management Plan – 2007 Soquel-Aptos Area* prepared by the District and Central Water District (CWD) (District and CWD, 2007). While Santa Cruz County is the primary agency for projects related to enhancing groundwater recharge, the District and CWD continue to support their efforts and assist in developing projects that could replenish the Soquel-Aptos area groundwater basin. For example, the District and CWD have supported the County's effort to implement groundwater recharge demonstration projects in developed areas at Polo Grounds Park and Brommer Street Park within the Groundwater Management Area. Installation of two separate facilities at Polo Grounds Park was completed in 2011 (HydroMetrics, 2012).

While enhanced groundwater recharge is being pursued by the District and other agencies, an alternative involving groundwater recharge enhancements was eliminated from further consideration in the District's IRP and in this EIR, given that the areas designated effective for surface recharge within the Soquel-Aptos area are very limited and given that such an alternative would not likely provide the volume of water needed to meet the District's needs of restoring groundwater to protective levels. Additionally, given the need to capture runoff and direct it to recharge basins, a project involving enhanced groundwater recharge would not likely reduce potentially significant impacts of the proposed project that would be reduced to less than significant with identified mitigation measures.

Water Import/Groundwater Banking with PVWMA- District

The draft and final IRPs considered a water import alternative as a future potential source of water supply that would have involved the neighboring water agency to the south, Pajaro Valley Water Management Agency (PVWMA). The alternative considered the purchase by the District of 2,000 afy of additional water from a federal water contractor or a water rights holder (possibly Santa Clara Valley Water District) and transfer of the water through a previously proposed new import pipeline that PVWMA was planning at the time. The water would have been delivered to agricultural lands within the PVWMA area that currently depend on groundwater. In exchange, the District would have received potable water from a single new groundwater production well in

Watsonville. The District would have paid for infrastructure costs needed to facilitate this water exchange.

Given that an import pipeline from outside the region is no longer being pursued by PVWMA, groundwater banking with PVWMA was not included in the 2012 IRP Update and would not be feasible. In addition, federal water contractors had faced supply cutbacks in recent years due to regulatory limitations on water exported from the southern part of the Sacramento-San Joaquin Delta, making it unlikely that surplus water would be available for transfer. Additionally, given the magnitude of an import pipeline, it is unlikely that such an alternative would have reduced the potentially significant impacts of the proposed project had it been pursued by PVWMA and the District. Therefore, an alternative involving groundwater banking with PVWMA was eliminated from further consideration in this EIR.

8.2.2 Various Reservoir Alternatives

The City and District have considered numerous reservoir alternatives over the last several decades, as described below, as a way of increasing storage and supply availability. As indicated in the City UWMP, the City remains open to exploring other water supply alternatives, including reservoir expansion and off-stream storage, but these alternatives are useful to consider over a 20-year or longer time frame. Regulatory permitting for new or expanded dams would be lengthy and may not be successful due to issues related to environmental resource impacts and water rights. For example, it is the current policy of the State Water Resources Control Board to deny any new on-stream dam applications. The California Department of Fish & Wildlife (formerly known as the Department of Fish & Game) and the National Marine Fisheries Service have adopted guidelines specifying that new permits for on-stream dams should be avoided. As a result, numerous on-stream reservoir projects in Central California have been mired in prolonged and contentious permitting phases.

Consequently, a project involving a new reservoir or reservoir expansion would not meet any of the project objectives given the lengthy timeframe involved in implementing such a project. Additionally, a new reservoir or reservoir expansion would likely cause greater environmental impacts and would have social and legal hurdles. Therefore, alternatives involving reservoir projects were eliminated from further consideration in this EIR, as further described below.

Maximizing Existing Sources and Storage in Loch Lomond - City

During the IWP planning process, improvements to maximize use of existing water sources and storage were identified that collectively could provide approximately 600 mgy during a two-year drought (Carollo Engineers, 2000). The objectives of this alternative were to find additional ways to use the City's existing sources more effectively and increase the overall yield from the system. The focus was to identify mechanisms for either minimizing use of Loch Lomond or further maximizing storage volume in the Reservoir via increased diversion to storage, to maximize the drought reserve available to the City. Four variations for use of surface water

supplies were considered: (1) increased capture and pretreatment of north coast supplies in lieu of treatment of Newell Creek and San Lorenzo River water; (2) increased capture of north coast supplies for diversion to storage in Loch Lomond Reservoir; (3) increased capture and pretreatment of San Lorenzo River water; or (4) increased capture of San Lorenzo River water with diversion to storage in Loch Lomond Reservoir.

The upgrades could include additional treatment for turbidity on the North Coast supply, capacity upgrades of the North Coast pipeline, treatment and/or facility upgrades for turbidity at the Tait Street intake, capacity upgrades at the Coast pump station, and/or upgrading the hydraulic capacity of the Felton/Loch Lomond supply system. The upgrades were further modeled during preparation of the IWP to assess their effectiveness.

The Carollo study concluded that the modeling for operation maximization and the four upgrades were all found to not have a significant impact on the size of drought curtailments (Gary Fiske & Associates, 2003), and the alternative was not further evaluated in the IWP. Since 2000, the upgrades either have been completed such as San Lorenzo River pump station improvements; are in progress (i.e., the North Coast water pipeline upgrade); or were found to result in only small water yields compared to the expense involved, (e.g. pre-treating turbid coast and river water). Any water savings achieved as a result of the upgrades implemented since this 2000 recommendation have been factored into the City's water system model, and the former estimate of 600 mgy as a potential separate alternative is no longer accurate (City, 2012a).

Additionally, once the City's pending habitat conservation planning process[1] is completed, less water will be available for diversion from surface sources, as indicated in **Section 3**. Therefore, the above alternative, which contemplates increased surface water diversions, would no longer be feasible under current conditions and regulatory constraints and would increase environmental impacts related to fisheries habitat. Therefore, an alternative involving increased surface water diversions was eliminated from further consideration in this EIR.

Zayante Creek Dam - City

A proposal to build a dam on Zayante Creek was pursued by the City for years beginning in the late 1960's with the purchase of most of the property needed. It was again discussed in the North Santa Cruz County Water Master Plan (NSCCWMP), prepared in 1985. The City investigated this project but there was concern over the environmental impacts. In 1986, the City ultimately relinquished its water rights to 5,000 million gallons of water from Zayante Creek with the request that the State Water Resources Control Board reserve this amount in the name of

[1] To address endangered and threatened fisheries issues due to the diversion of surface waters, the City has been in the process of developing a Habitat Conservation Plan (HCP) under the Federal Endangered Species Act (ESA) with the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) and will be working on similar planning under the California ESA with California Department of Fish and Wildlife (CDFW).

North Santa Cruz County (Gary Fiske & Associates, 2003). Environmental issues included, but were not limited to: (1) the proposed location on an earthquake fault; (2) flooding of an area and its associated effects on flora and fauna; and (3) the growth inducing potential of providing a large new source of water. Additionally, Zayante Creek is a known habitat for steelhead and is also a priority Coho recovery stream.

Given the conclusions made in prior studies and decisions made by the City to relinquish the water rights, this alternative was not evaluated in the IWP. The alternative was eliminated from further consideration from this EIR as it could not be implemented in a timely manner and would likely result in greater environmental impacts than the proposed project

Olympia Quarry – City and District

During the IWP planning process, reservoir storage in the Olympia Quarry near Felton was considered to provide additional storage to augment the storage provided by Loch Lomond Reservoir (Carollo Engineers, 2000). This alternative was based on a proposal from the gravel quarry operators to extend mining below the existing groundwater table, which would create a small lake at the completion of mining. Depending on the final excavated volume from the quarry, the resulting lake volume would be approximately 160 to 190 million gallons. The lake could be contained by the walls of the quarry excavation; or increased storage volume could be provided with the construction of a dam. This alternative would have required that the quarry operators submit a permit application to Santa Cruz County (County) to extend the mining operation and that the County approve the application. Carollo Engineers identified numerous technical and institutional issues that caused them to deem the storage at Olympia Quarry to not be viable (Carollo Engineers, 2000). The Olympia Quarry alternative was also considered by the District in its IRP process. This alternative was not pursued by the District given that it was believed that surplus supply and storage would not be available for the District, as it would be needed by the City, and due to the exceedingly long pipeline (approximately eight miles) that would be required to serve the District.

Given the conclusions made in prior studies, this alternative was not evaluated in the IWP. The Olympia Quarry is no longer in operation and the concept of using old quarries for water supply storage has not been pursued by any of the water agencies in the County. However, a Task Force of County water officials looked at abandoned quarries for potential use in groundwater recharge. The Northern Santa Cruz County Preliminary Integrated Regional Water Management Plan (Kestrel Consulting, Inc. and Gary Fiske & Associates, 2005) identified conducting a feasibility study for enhanced aquifer recharge as a high priority project.

Via a Proposition 50 Water Bond grant from the State Water Resources Control Board, the Santa Cruz County Conjunctive Water Use and Enhanced Aquifer Recharge Study is under preparation to assess the most appropriate approaches for coordinating water projects in the Santa Margarita Groundwater Basin for increasing the volume of groundwater storage in order to improve the drinking water supply reliability, mitigate declines in groundwater levels, and increase stream

baseflow in the lower San Lorenzo River Watershed. The Conjunctive Use Project will investigate the opportunities to use water exchanges, winter streamflow diversion, enhanced stormwater capture and recharge, and/or reclaimed wastewater to replenish groundwater storage. The two goals of the Conjunctive Use Project are to increase the volume of groundwater in aquifer storage and to increase summertime baseflow in streams by increasing groundwater levels (Kennedy/Jenks, 2010a-e; 2011a-d).

This study will establish the feasibility and appropriate approach for using existing sand quarries, such as Olympia Quarry and other quarries in the San Lorenzo Watershed for settling and percolation ponds to recharge the Santa Margarita aquifer.

If pursued, these types of projects would not directly benefit the City or the District, as neither rely on groundwater from the Santa Margarita aquifer. Although the plan suggests some small incremental improvement in base flows in the San Lorenzo River and tributaries could be possible, the anticipated increases would not be sufficient to meet the needs identified as part of the project objectives. Thus, this project was eliminated from further consideration as an alternative in this EIR.

On-Stream Reservoir on Soquel Creek (Glenwood) – District

The District also considered an on-stream reservoir on Soquel Creek (Glenwood) in its IRP process. The on-stream reservoir alternative considered during the IRP processes looked at an on-stream reservoir that would involve building a dam on Soquel Creek. The previously proposed Glenwood Reservoir Project would be located on the West Fork of Soquel Creek in the Glenwood Basin. A transmission pipeline would convey the stored water from the reservoir to a treatment plant. After treatment, the potable water could be delivered directly into the distribution system.

In 2007, the District's water rights application for Soquel Creek was canceled due to inaction and the petition for reassignment was closed. However, the District holds an "in trust" water right[2] of 7,250 af per annum. The actual annual yield from this project is unknown. Calculations of fish flow requirements and net annual retention in the proposed reservoir have not been done.

In the 2006 IRP, this alternative was determined to be infeasible because of significant environmental and regulatory issues relating to "in trust" water rights and Endangered Species Act issues. According to the 2012 IRP, those issues have only magnified since the original evaluation. The 2012 IRP Update confirms the conclusions of the 2006 IRP and indicates that this alternative is considered infeasible based on current knowledge and understanding of

[2] The State Water Rights Board holds these water rights "in trust". Utilization of these water rights would require a totally new application that would be subject to the current laws and regulations. It is considered that any such application would be unlikely to be approved, given the Endangered Species Act issues for anadromous salmonids within Soquel Creek.

regulatory climate. Therefore, this alternative would not meet the primary objectives of the proposed project. Consequently, the 2012 IRP Update indicates that this alternative will not be considered further (District, 2012a). Therefore, an alternative involving a dam on Soquel Creek was eliminated from further consideration in this EIR.

Soquel Creek Off-Stream Diversion- District

As part of the IRP processes, the District considered and evaluated a water supply alternative that would divert surface water from Soquel Creek (Environmental Science Associates, 2006; District, 2012a). The alternative would entail the diversion of surface water from Soquel Creek when stream flows are high. The diverted water would be pumped into a settling pond, treated at a new surface water treatment plant, and conveyed into the District's water distribution system for direct use. During periods when diverted flows exceed demand in the water distribution system, the water would be injected into the aquifer for artificial recharge of the groundwater basin. This alternative would also require the construction of approximately 2.5 miles of pipeline to deliver diverted and treated water to the District's distribution system, as well as the construction of up to nine new wells to improve groundwater injection capacity (Environmental Science Associates, 2006). A feasible diversion site and sufficient land for a 49 acre-feet (af) storage reservoir would need to be acquired (District, 2012a).

In 2004, Linsley Kraeger Associates estimated an average annual yield of 1,500 acre-feet per year (afy) using a 37 cubic feet per second (cfs) bypass (which assumed removal of a downstream impediment), a diversion capacity of 14 cfs, a storage capacity of 49 af and a treatment plant capacity of 14 cfs with operation from November 1 to April 30 (6 months). Soquel Creek is already fully appropriated (or used) for beneficial uses from April 1 to November 30 so the District would theoretically only be able to divert water from December 1 through March 31 (4 months). As the 2004 yield estimate of 1,500 afy accounts for two additional months of water diversion, the actual average yield is likely less than 1,500 afy (District, 2012a).

In 2007, the District's water rights application was canceled due to inaction and the petition for reassignment was closed. As indicated above, the District may have "in trust" water rights of 7,250 afy for the proposed Glenwood Reservoir and 6,800 afy for the proposed Upper Soquel Creek Reservoir that could possibly be transferred to a downstream diversion location with a new application. The District would have to re-apply for water rights for a diversion on Soquel Creek to be pursued. An application seeking to access and change the point of diversion could result in nothing approved or a much smaller allocation (District, 2012a).

The soonest estimated availability of water from this source is 10 to 20 plus years, if the water rights could be obtained (District, 2012a). If water rights could be obtained, it is uncertain if potential yield could be maintained. The yield would be dependent on rainfall and the outcome of a likely Habitat Conservation Plan (HCP) process, which would likely reduce the amount of surface water available. An HCP would likely be required given that Soquel Creek is recently

listed on the Coho Salmon Recovery Plan (NMFS, 2012) and is already federally listed for steelhead.

The 2012 IRP indicates that if the proposed regional desalination project is not approved, the Soquel Creek Off-Stream Diversion is one of several alternatives held in "reserve for potential future consideration." However, this strategy would require substantial additional time to investigate the viability of and then pursue such an alternative, which would pose unacceptable risks related to the over-drafted groundwater basin and potential for seawater intrusion. Additionally, potential impacts to fisheries in Soquel Creek could be a factor in limiting potential yield of such an alternative. Since substantial additional time would be required to pursue this alternative, it would not meet the objective of providing for a near-term supplemental supply of water. Without a supplemental supply in the immediate near term, further depression of groundwater levels in the Soquel-Aptos area would likely occur, which would further increase the risks of or cause seawater intrusion. Additionally, this alternative would not necessarily have less environmental impacts than the proposed project. Therefore, an alternative involving a Soquel Creek Off-Stream Diversion project was eliminated from further consideration in this EIR. However, as indicated above, it could be pursued by the District in the future if the proposed project is not approved.

Other Reservoir Alternatives – City

Four other surface storage projects were evaluated and determined to be potentially viable during a 1994 study conducted by CDM (CDM, 1994). These included Waterman Gap Reservoir, Kings Creek Reservoir, Yellow Bank Creek Reservoir, and Loch Lomond enlargement via raising Newell Creek Dam. Additionally, a prior study also identified Bald Mountain School Dam, Baldwin Creek Dam, Glenwood Dam, Jamison Dam, and Bear Creek Dam, but these were not carried into the CDM study for various reasons, such as insufficient supply or geological issues (Gary Fiske & Associates, 2003). All of these surface storage alternatives would face major regulatory and environmental review requirements. Thus, even if these projects were to prove to be technically feasible, the lead-time for their development would be very lengthy once a decision was made to pursue one of these projects, as described above, and they may result in greater environmental effects.

The City's critical immediate need for new supply led to the conclusion in the IWP that these surface storage projects should not be considered and therefore they were not evaluated as part of the IWP. However, the IWP did indicate that this policy decision does not preclude possible future consideration of these alternatives (Gary Fiske & Associates, 2003). As indicated above, however, these alternatives are useful to consider only over a 20-year or longer time frame and ultimately may not be feasible given regulatory hurdles. Therefore, an alternative involving a reservoir project was eliminated from further consideration in this EIR.

8.2.3 Range of Reclamation/Recycled Water Alternatives

Both the City and the District have reviewed a range of recycled water alternatives as part of their IWP and IRP, respectively and as part of this EIR. Recycled water is defined as wastewater treated to a specified quality in order to be used for a specified purpose. The production, discharge, distribution, and use of recycled water are subject to federal, state, and local regulations, the primary objectives of which are to protect public health. The City's Wastewater Treatment Facility (WWTF) does not currently produce, nor is it permitted to produce, recycled water for offsite uses such as landscape irrigation or other non-potable residential or commercial uses. However, 0.15 to 0.2 mgd of recycled water has been used at the plant to meet its major process water needs including chemical mixing, contact and non-contact cooling water, equipment washing, and heating (City, 2011e).

The City's treated wastewater is currently potentially suitable for only very limited agricultural irrigation for non-edible crops and for flushing of the wastewater distribution system. No such agricultural uses for water of this quality are known to occur in the City service area. Therefore, the only allowed use currently would be for sewer system flushing. The present level of wastewater treatment is not sufficient for the water to be used for unrestricted use at playgrounds, parks, schoolyards, construction, industrial processes, or general landscape irrigation. Any further use of recycled water would require upgrades to the City's wastewater treatment plant.

The potential for recycled water use has been evaluated in several studies: *Alternative Water Supply Study* (Carollo Engineers, 2000), *Evaluation of Regional Water Supply Alternatives* (Carollo Engineers, 2002), *Water Recycling Facilities Planning Study* (Black & Veatch, 2009), a white paper addressing recycled water opportunities and limitations (Kennedy/Jenks Consultants, 2010f), and in **Appendix Z, Current and Potential Future Opportunities for Indirect and Direct Potable Reuse of Recycled Water.** The recycled water applications evaluated in these studies include:

- Indirect potable reuse
- Direct potable reuse
- Use of recycled water from Scotts Valley
- Agricultural irrigation on the North Coast
- Urban landscape irrigation

All of these applications are further described below and two alternatives involving these applications are evaluated in detail in **Section 8.3.** These include a Proposed Project Plus Direct Potable Reuse Pilot Alternative and a Regional Recycle Water for Irrigation Alternative.

Indirect Potable Reuse – City and District

Indirect potable reuse is the planned incorporation of highly purified recycled water into a source water supply such as a potable groundwater aquifer or water storage reservoir, resulting in mixing and assimilation. The water typically receives additional treatment prior to distribution as drinking water. Groundwater recharge reuse regulations for indirect potable reuse have been under development for the last 30 years and are now in the final stages towards approval through the California Department of Public Health (CDPH) and Regional Water Quality Control Boards (RWQCBs). The Groundwater Replenishment Reuse Draft Regulations are anticipated to be adopted by December 31, 2013 (per Water Code section 13560 et seq., as created by Senate Bill 918, enacted in 2010) (**Appendix Z**). Indirect potable reuse to supplement water supplies can include projects that provide for groundwater recharge or reservoir augmentation, as further described below.

Groundwater Recharge

Recycled water can be injected into a groundwater basin for future extraction, followed by treatment and potable use. This concept was reviewed for its feasibility for both the City and the District as it was thought to have potential to help replenish the over-drafted conditions within the Soquel-Aptos groundwater basin management area.

Orange County Water District in Southern California operates an indirect potable reuse program to recharge its large and relatively un-constrained groundwater basin. There would be significant challenges for a similar program for the City and District. The challenges to establishing an indirect potable reuse groundwater recharge program in the Soquel-Aptos area include significant physical constraints with the geology and groundwater basin characteristics, as well as financial, regulatory and operational constraints (Kennedy/Jenks, 2010 and **Appendix Z**), including the following:

- **The local geology is not conducive to significant recharge**. The Soquel-Aptos area, which contains the Purisima basin aquifer that is relatively confined with complex geology. The areas for injection are limited by bedrock, and proximity to the ocean and other wells. Numerous small wells with extensive distribution piping would be required to inject the recycled water and the volumes are not sufficient to recharge the basin.
- **There is limited space to locate injection wells away from drinking water wells**.[3] Locating recycled water injection wells to meet the proposed physical and travel time separation requirements would be very challenging as there are over a thousand private potable water wells within the Soquel-Aptos area, as well as the nineteen municipal wells

[3] The injection wells would be required to be separated from all public and private wells by a minimum 6-month groundwater travel time. Initially, a 12- to 24-month separation between injection wells and production wells would be required, further limiting the available injection well locations (Kennedy/Jenks Consultants, 2010 and Appendix Z).

for District and City (see **Figure 3-5, Groundwater Production and Monitoring Wells** in **Section 3**). The large numbers of existing wells, the rugged terrain and underlying geology, and the urban areas over the basin limit the ability to locate injection wells that comply with the CDPH separation requirements.

- **There is limited to no blending water available**. Requirements to blend the recycled water with other surface or groundwater sources during injection would place additional demands on these already-insufficient surface and groundwater sources. High levels of treatment reduce the blend requirements, but the lack of blend water may limit injection.
- **New recycled water infrastructure would be extensive**. The recycled water would have to be conveyed in new dedicated recycled water pipelines long distances from the treatment plant to the injection sites. Because of the urban nature of the City and District groundwater basin areas, percolation ponds are not practical. The new treatment and distribution piping would be prohibitively expensive for the amount of water produced for injection and associated volume of groundwater pumping offset. As indicated in **Appendix FF, Conceptual-Level Cost Comparison of Water Supply Alternatives**, the capital and unit per acre-foot of water costs for such an alternative would be substantially higher than such costs for the proposed project.

Overall, a groundwater recharge project involving indirect potable reuse would face significant challenges due to the basin geology, avoiding the high number of private and municipal wells, regulatory uncertainties, infrastructure requirements, and the associated costs to treat and convey water up to multiple injection points. For these reasons a groundwater recharge project is considered to be not practical or feasible (**Appendix Z**). Additionally, given how extensive the treatment and distribution improvements would be for such a project and the need for another source of water for blending, an indirect potable reuse project involving groundwater recharge would not likely reduce environmental impacts. Therefore, an alternative involving indirect potable reuse for groundwater recharge has been eliminated from further consideration in this EIR.

Reservoir Augmentation

Another type of indirect potable reuse is reservoir augmentation. The City of San Diego is conducting a water purification demonstration project to investigate sending highly treated recycled water to its surface water reservoir to augment the drinking water supply. The California Department of Public Health (CDPH) has conditionally approved the San Diego reservoir augmentation concept. It is anticipated the forthcoming CDPH regulations for indirect potable reuse reservoir augmentation could be similar to the requirements for the proposed San Diego project.

The current feasibility of establishing an indirect potable reuse reservoir augmentation project in Santa Cruz area is limited due to the relatively small size and narrow configuration of the Loch Lomond Reservoir, its distance from the source of recycled water supply, and the fact that it fills

naturally in 7 out of 10 years, and thus has no capacity for additional storage in those years. A reservoir augmentation project would face significant challenges due to the quantity and quality of water in Loch Lomond Reservoir, regulatory uncertainties, infrastructure requirements and the associated costs and energy to treat and convey water up to the reservoir. As examples, water quality considerations include the effect of nutrients on bio-stimulation in Loch Lomond; and the costs and energy use would be relatively high due to the requirement to pump the purified recycled water up to Loch Lomond and then re-treat it through the Graham Hill WTP.

An indirect potable reuse project using Loch Lomond Reservoir would not meet the general regulatory framework conditionally approved by the CDPH in San Diego due to the small capacity of the reservoir, high percentage of recycled water present, and inability to meet hydraulic retention times. For these reasons, in addition to the other challenges described above, an IPR reservoir augmentation project is considered to be not practical feasible to meet the City and District objectives for a supplemental water supply (**Appendix Z**). Therefore, an alternative involving indirect potable reuse for reservoir augmentation has been eliminated from further consideration in this EIR. However, there may be a potential variation on this concept that could be pursued in the long-term as a DPR project, as described below.

Direct Potable Reuse – City and District

Direct potable reuse is the introduction of highly purified recycled water either directly into the source water supply immediately upstream of drinking water treatment plant or into the potable water supply distribution system downstream of a drinking water treatment plant. For example, a direct potable reuse source water augmentation project could involve blending advanced treated recycled water with source water in Loch Lomond Reservoir or with the source water before the inlet of the GHWTP.

The resulting drinking water would meet or exceed all drinking water standards. Direct potable reuse is not currently permitted in California and, as such, there are no direct potable reuse projects in operation. In 2010 the Legislature passed, and the Governor signed Senate Bill No. 918 (SB 918) that directs the California Department of Public Health (CDPH) to investigate the feasibility of developing uniform water recycling criteria for direct potable reuse and to provide by December 31, 2016 a final report to the Legislature on that investigation.

Based on the estimated timeframe for adoption of uniform water recycling criteria for indirect potable reuse, direct potable reuse regulations may not be available in California until the 2020s. Until the regulations are in place, the CDPH is generally willing to work with agencies on a case-by-case basis to evaluate indirect and direct potable reuse projects. For example, the CDPH is working with the City of San Diego to evaluate an indirect potable reuse reservoir augmentation project, as described previously, and has established criteria and granted conditional approve for demonstration testing. However, the San Diego indirect potable reuse reservoir augmentation project has taken over a decade to progress through conditional acceptance and demonstration testing, and is still years away from implementation and operation.

Therefore, a direct potable reuse project is not feasible in the timeframe of the proposed project, given that: 1) direct potable reuse projects currently are not permitted in California; 2) the CDPH has not evaluated or conditionally approved any direct potable reuse projects; 3) conditional approval, demonstration testing and implementation would likely take a decade or more; and 4) direct potable reuse faces significant public perception challenges (**Appendix Z**). Additionally, given how extensive the treatment and distribution improvements would be, a direct potable reuse project would not likely reduce environmental impacts. Therefore, an alternative involving direct potable reuse has been eliminated from further consideration in this EIR.

Should regulations change in the future and allow for direct potable reuse following treatment, a seawater desalination plant could be readily converted to treat effluent from a wastewater treatment facility instead of seawater. Conversion of a desalination plant to a direct potable reuse plant would lower the overall energy use of the facility and reduce or eliminate the withdrawal of seawater from the ocean. (**Appendix Z**).

The treatment technologies for removing salts from seawater are very similar to those used to purify recycled water for potable reuse. For a future direct potable reuse facility, the potable water (highly treated recycled water) could be delivered to the inlet of the City's drinking water treatment plant, or potentially into the distribution system similar to a seawater desalination facility. The brine from the potable reuse facility would have much lower TDS and would be blended with remaining secondary effluent discharged from the WWTF, and dispersed into the ocean through the existing outfall, similar to what would occur with the proposed project. A small direct potable reuse demonstration pilot testing system could be constructed along with the seawater desalination facility. This could permit the agencies, CDPH and public to evaluate the treatment technology and help to facilitate future approval and acceptance of this alternative water supply approach. Such a pilot project at the proposed desalination plant is considered as an alternative in **Section 8.3**.

Reclamation/Coast Groundwater Exchange – City and District

The strategy of using recycled water for agricultural irrigation was developed by Carollo Engineers (2000) and Black & Veatch Engineers (2002) and considered alongside desalination in the City's IWP. Two alternatives were evaluated, including an alternative serving only the City and an alternative serving both the City and District. The general concept involved an exchange in which the City would provide recycled water to North Coast growers in all years, and in return, the City would obtain exclusive access to the grower's coastal groundwater basin to use as a reserve supply in drought years. It would require building a 4 to 7 mgd tertiary wastewater treatment plant, new groundwater wells and transmission facilities to extract and deliver groundwater to the City water system in droughts and potentially the District, as well.

Based on the limited information that was available on groundwater hydrology in this area, the IWP assumed a safe annual yield from this source could be 700 million gallons. However, it also indicates that the safe annual yield could be as low as 400 million gallons. If the yield were in

fact that low, the IWP indicated that this alternative could not meet the water supply needed to meet the City's demands (with conservation and 15 percent curtailment) and the yield would be insufficient to be considered a regional project with the District.

Upon evaluation, several major flaws emerged with this recycled water concept, including: (1) uncertainty about the yield in a multi-year drought; (2) disinclination of State Parks to support the project; and (3) opposition voiced by local organic growers. Specifically, State Parks, which is the major landowner above the groundwater basin being used by the coastal growers, expressed its opposition to the reclamation project. In a letter dated September 11, 2002, it stated that the exchange was felt to involve "uncharted legal and complex policy issues having serious long-term implications of statewide consequence" and that "the use of reclaimed water at Wilder Ranch could result in potential adverse impacts to sensitive natural resources, place possible constraints on recreational usage and adversely impact organic agricultural leasing operations at Wilder Ranch State Park."

The project was also opposed by local organic growers over concerns related to food safety, suitability of recycled water for organic crops, certification, and marketing if recycled water was brought up the coast. Ultimately, the State's unwillingness to consider the groundwater exchange represented a major, if not insurmountable, barrier to moving forward with the reclamation strategy (Gary Fiske & Associates, 2003). While the IWP committee discussed bringing legislative pressure to challenge State Park's position, it decided against taking that approach given the doubts about the groundwater yield and the potential for lengthy delay. It should be noted that recent contact with State Parks indicates that they still do not support any proposal to transfer groundwater found in the park to the City in exchange for recycled water from the City (Roth, 2013).

Therefore, for the reasons stated above this potential alternative was dropped from further consideration as part of the IWP process. This alternative would also fail to meet the project objectives for the proposed project given the factors described above. Additionally, given how extensive the treatment and distribution improvements would be for such a project, this alternative would not likely reduce environmental impacts. Therefore, an alternative involving the use of recycled water for North Coast agricultural applications has been eliminated from further consideration in this EIR.

Recycled Water Exchange with Scotts Valley Water District - City

The City has been exploring a long-term recycled water and potable water exchange that involves Pasatiempo Golf Club and the Scotts Valley Water District (SVWD). This project, initiated by SVWD, would provide SVWD with potable water from the City during the winter non-peak period, when the City has some excess surface water available. In exchange the SVWD would provide recycled water for irrigation to the Pasatiempo golf course, one of the City's larger summer irrigators.

In order to facilitate this exchange, 14,800 linear feet of intertie pipeline and a booster pump station would need to be constructed to connect the SVWD's water system with the City system. It would also involve intercepting flow in the outfall pipe that conveys secondary treated effluent from the Scotts Valley Wastewater Treatment Plant and piping it to a site near the golf course for treatment and storage. The 200,000 gallons per day of recycled water would be supplemented by local golf course-owned groundwater. Through this exchange, the SVWD would provide about 40 mgy of recycled water to the golf course beginning in 2020. Through this exchange the SVWD, would reduce its annual groundwater demand by receiving City water in the winter in amounts equal to the amount of recycled water it provided to the City during the previous summer period.

This arrangement would benefit the City by effectively shifting some of the peak summer demand to the winter season when the City is not drawing from surface storage, and benefit the SVWD by reducing groundwater extraction. It would also establish a link between the two water agencies for mutual benefit in case of a water emergency and make more efficient use of regional water supplies. The City in 2007 adopted a resolution declaring its interest in pursuing this recycled/potable water exchange arrangement and it continues to work with the parties to negotiate a Memorandum of Agreement that would set forth the conditions for this project to proceed.

While this exchange continues to be pursued, it does not constitute an alternative to the proposed desalination project as it would simply shift demand for City water from summer to winter and would not result in a net increase in water supply. While the transfer would nominally reduce the demand for water in the summer during wet and normal years, during a drought irrigation water such as that provided to Pasatiempo would already be restricted under the City's Water Shortage Contingency Plan. As the exchange would not result in a net increase in water supply and would not offset potable water needs for the City during drought, it would not meet any of the project objectives. Therefore, an alternative involving the use of recycled water at the Pasatiempo Golf Course has been eliminated from further consideration in this EIR.

Satellite Reclamation Plants - District

The District's 2006 IRP indicated that using satellite reclamation plants (SRP) may have appropriate applications within the District. SRPs are an alternative to traditional water recycling facilities constructed as part of a wastewater treatment plant, in that they are small in size and can be placed directly at or near a site without requiring major infrastructure upgrades (District, 2011a). SRPs are a proven technology for recycling wastewater for non-potable uses (e.g., landscape irrigation). Therefore, water produced from a SRP is not for potable use and would only be used for irrigation of the golf course, park, etc. (District, 2012a).

Pursuant to the 2006 IRP, the District evaluated the feasibility of providing recycled water to select customers through SRPs within the District's service area. The District conducted the *Water Recycling Facilities Planning Study* (Black & Veatch, 2009) to evaluate the feasibility of

providing recycled water, via SRPs, to sites with large landscapes. The conclusions of this study were recently summarized in the District UWMP (District, 2011a), as provided below. Twenty five potential recycled water users were evaluated in this study based on estimated recycled water demand and available supply. Potential recycled water users having less than 20 afy of water demand were eliminated from the study based on cost-effectiveness, leaving two potential customers: (1) Polo Grounds Regional Park and Aptos Junior High (PGR Park/AJH) in Aptos; and (2) Seascape Golf Course (SGC) in Aptos. The study concluded that the PGR Park/AJH site was not feasible due to engineering limitations of the sewer system in this area.

The Seascape Golf Course was identified as the only potential site within the District's service area capable of using an SRP to produce non-potable water for irrigation purposes. The yield was estimated at 134 afy. If Seascape Golf Course was to reduce non-potable water use by 134 afy, it could help overdraft conditions within the basin; however, it would not reduce the potable water needs or pumping demands of the District, as Seascape uses their privately owned well to produce water.

Seascape Golf Course would be the user of the recycled water to meet it irrigation needs, so implementation is dependent on operational use agreements. The law firm of Hatch and Parent (now Brownstein Hyatt Farber Schreck), who represent American Golf Corporation Seascape Golf Course, submitted a letter in 2007 regarding their concerns and stipulations on use of recycled water, cost, and interference with course operation and liability (District, 2012a).

The District does not have any large irrigation accounts that could utilize satellite reclamation plants (SRPs) and reduce the District's potable water use. The irrigation accounts that are applicable for SRP-uses in the District's service area, such as Seascape Golf Course, currently use private wells to irrigate, so beneficial use would help the basin but not the District's water shortage needs. Further, the estimated cost of recycled water produced by SRPs would be greater than that for the proposed project. For these reasons, the 2012 IRP Update indicates that SRPs should not be considered further as part of the water supply alternatives under evaluation by the District (District, 2012a). Additionally, SRPs could not meet primary project objectives as they relate to the District's services, as they could not provide sufficient water needed by the District to offset groundwater pumping. Therefore, an alternative involving SRPs was eliminated from further consideration in this EIR.

Urban Landscape Irrigation – City and District

Using recycled water for landscape irrigation is considered technically feasible and may partially meet some of the project objectives. The alternative of using recycled water for landscape irrigation is discussed in detail in this EIR. See **Section 8.3** for a detailed analysis of this alternative.

8.2.4 City- and District-Only Desalination Projects

District-Only Desalination Project (within District's Service Area)

As with the City's IWP, the District's IRP also considers the possibility of implementing a desalination project to serve only the District. The IRP indicates that the District performed a reconnaissance-level assessment of the potential for development of a subsurface seawater intake on the beachfront areas within the District service area. The study evaluated whether seawater from shallow beach wells could be used as feedwater for a desalination facility that would produce up to 1.5 mgd. The conclusions of the report indicated that vertical wells are infeasible given the shallow sand in the area. Additionally, there is no known existing wastewater outfall that could be used for blending of the brine discharge; no cost-sharing opportunities as would be available with a regional desalination project with the City; and substantial additional investigations and environmental review would be required to pursue such an alternative (District, 2012a). As a result of the evaluations conducted in the District's IRPs, the District has determined that it will not further consider this alternative (District, 2012a). Therefore, an alternative involving a District-only desalination project in the District's Service Area was eliminated from further consideration in this EIR.

The most recent 2012 IRP does place in "reserve" for potential future consideration of a District-only desalination project that would be the same as the proposed project, but without the City as a partner. This alternative, which would rely heavily on City infrastructure, is evaluated in detail in **Section 8.3**.

City-Only Desalination Project

An alternative involving a City-only desalination project is evaluated in detail in **Section 8.3**.