4.10 HYDROLOGY AND WATER QUALITY: GROUNDWATER

4.10.1 Introduction

This section assesses the environmental impacts of the Proposed Project on groundwater resources, including on water quantity, storage, water levels, and water quality of the Salinas Valley Groundwater Basin and Seaside Groundwater Basin (hereafter referred to as "Seaside Basin"). A discussion of cumulative impacts is provided at the end of the section. The section is based on the following reports prepared as part of project development and EIR preparation:

- *Recharge Impacts Assessment Report, Pure Water Monterey Groundwater Replenishment Project* (Todd Groundwater, 2015a), included in **Appendix L**, which includes the following technical memoranda as appendices:
    - Appendix A: *Technical Memorandum, Selection of Recharge Location for Proposed Project, Seaside Basin* (Todd Groundwater, 2014)
    - Appendix B: *Technical Memorandum, Groundwater Replenishment Project Development Modeling* (HydroMetrics WRI, 2013)
    - Appendix C: *Technical Memorandum, Proposed Project EIR: Project Modeling Results* (HydroMetrics WRI, 2015)
- *Technical Memorandum for the Pure Water Monterey Groundwater Replenishment Project: Impacts of Changes in Percolation at the Salinas Industrial Wastewater Treatment Facility on Groundwater and the Salinas River* (Todd Groundwater, 2015b), included in **Appendix N**;
- *Hydrogeologic Field Investigation: MRWPCA Monitoring Well 1 (MW-1) Installation, Groundwater Quality Characterization, and Geochemical Assessment, Monterey Peninsula Groundwater Replenishment (GWR) Project* (Todd Groundwater, 2015c);
- *Pure Water Monterey Groundwater Replenishment Project Water Quality Statutory and Regulatory Compliance Technical Report* (Nellor Environmental Associates, February 2015), included in **Appendix D**; and
- *Cumulative Projects Modeling Results* (HydroMetrics WRI, 2015), included in **Appendix N.**

Public and agency comments related to groundwater resources were received during the public scoping period in response to the Notice of Preparation, and are summarized below:

- Address discharge rate and natural capacity of Seaside aquifer and flow rate between injection and extraction wells.
- Determine the current residence time of the recharged water as specified by the State.
- Complete groundwater modeling.
- Evaluate both the travel time and volume of water moved between injection and extraction sites in order to determine what portion of injected water can be safely extracted and when.
- Confirm with the State Water Resources Control Board (SWRCB), Division of Drinking Water (formerly, California Department of Public Health) the required residence time between injection and extraction for all proposed water sources prior to the publication of the Draft EIR.
- Confirm the capacity of the Seaside Basin is sufficient, within that predetermined residence time, for the injection of the Proposed Project purified recycled water.
- Confirm with the SWRCB, Division of Drinking Water (DDW) that the horizontal distance required between points of injection and extraction are adequate in the event those two modes of operation are simultaneously occurring.

To the extent that issues identified in public comments involve potentially significant effects on the environment according to the California Environmental Quality Act (CEQA) and/or are raised by responsible agencies, they are identified and addressed within this EIR. For a complete list of public comments received during the public scoping period, refer to **Appendix A, Scoping Report**.

4.10.2 Environmental Setting

This section describes the existing conditions of the Salinas Valley Groundwater Basin and the Seaside Basin relevant to the Proposed Project. **Figure 4.10-1**, **Regional Groundwater Basins and Subareas Map,** shows the relationship between the two groundwater basins and the Proposed Project components that overlie each basin. The components of the Proposed Project that overlie the Salinas Valley Groundwater Basin include the Source Water Diversion and Storage sites (all except the Lake El Estero Diversion site in the City of Monterey); the Treatment Facilities at the Regional Treatment Plant; and the northern portions of the Product Water Conveyance system, including both RUWAP and Coastal pipeline alignments and the Booster Pump Stations. The Proposed Project components that overlie the Seaside Basin include the Product Water Conveyance Pipeline along General Jim Moore Boulevard; the pipeline connection to and the entire Injection Well Facilities; the CalAm Distribution System: Transfer Pipeline: and a portion of the CalAm Distribution System: Monterey Pipeline. The Lake El Estero Diversion site does not overlie a groundwater basin from which water is extracted for municipal water supply uses. Specific components of the Proposed Project would have potential implications for these groundwater basins. The existing conditions related to specific Proposed Project components are described in detail in the following sections after the overview of the regional groundwater setting for each groundwater basin.

4.10.2.1 Terminology and Concepts

Groundwater is the water occurring beneath the earth's surface and hydrogeology refers to the study of how that water interacts with the underlying geologic units of rock and soil. Most groundwater occurs in material deposited by streams, generally called alluvium. Alluvium consists of sand and gravel deposits and finer-grained deposits such as clay and silt. Fluvial deposits, although commonly generically included with alluvium, more specifically refer to deposits laid down by rivers and streams as a result of bank erosion, where the material is transported and redeposited in the form of bars, points, and flood plains.

Coarse materials such as sand and gravel deposits usually provide the best storage capability for water and, when saturated with water, are termed aquifers. Finer-grained clay and silt deposits are relatively poor for water storage and use, and are referred to as aquitards, in that they restrict or impede the vertical migration of groundwater or infiltrated surface water. Aquifers can extend over many square miles and are referred to as basins. A groundwater basin is defined as an aquifer or a stacked series of aquifers with reasonably well-defined boundaries in a lateral direction and a definable bottom. California's groundwater basins typically include one aquifer or a series of aquifers with intermingled aquitards.

In general, groundwater basin boundaries are determined by physical attributes such as the lateral extent of aquifers, boundaries to flow such as bedrock, and groundwater divides. A groundwater divide, like a surface water divide, separates distinct groundwater flow regions within an aquifer. A divide is defined by a line on either side of which groundwater moves in divergent directions.

Depending on the continuity of the permeable layers, groundwater may be present under unconfined, semiconfined, or confined conditions. The water table in an unconfined aquifer is under the pressure exerted by the overlying water and atmospheric pressure, and groundwater under these conditions flows from areas of high groundwater elevation to areas of low groundwater elevation. Localized water tables, or perched aquifers, also have the ability to transmit and store groundwater within the groundwater basins due to the presence of impermeable and discontinuous layers that are present in the shallow alluvial deposits. Under semiconfined and confined conditions, vertical flow from or to the aquifer is restricted by overlying aquitards. Groundwater under confined or semiconfined conditions flows from areas of high pressure to areas of low pressure and is influenced by the pressure, weight, and confining nature of overlying sediments; water entering the aquifers from areas of recharge; and water leaving the aquifers through natural discharge or through the pumping of supply wells. The groundwater flow direction is measured by the potentiometric surface – an imaginary surface that is analogous to an actual water surface exposed to atmospheric pressure. When a well penetrating a confined aquifer is pumped, internal aquifer pressure is reduced, which can increase the flow of water towards the well.

4.10.2.2 Overview of Project Area Groundwater Basins and Aquifers

The California Department of Water Resources (DWR), in its Bulletin 118 (*California Groundwater*), has delineated the hydrogeologic boundaries of groundwater basins in California; both the Salinas Valley Groundwater Basin and the Seaside Basin are identified in Bulletin 118 (California DWR, 2015). These two groundwater basins are used for water supply and are located in the geographic area of the physical components of the Proposed Project and may be affected by the Proposed Project construction and/or operation. The hydrogeologic boundaries determined by the DWR have been subsequently refined and adjusted based on new information, groundwater basin management operations, and results of updated hydrogeologic studies. The DWR (2003), Kennedy/Jenks (2004), the Monterey County Water Resources Agency (MCWRA, 2006) and the Monterey Peninsula Water Management District (MPWMD) working with the Seaside Watermaster, each have provided updated interpretations of the basin boundaries, as well as the delineation of subareas or subbasins within some basins. In addition, recent studies have further adjusted basin boundaries and subdivided basins into subareas or subbasins based on groundwater flow patterns.

4.10.2.3 Salinas Valley Groundwater Basin and Study Area

The Salinas Valley Groundwater Basin is about 560 square miles (MCWRA, 2006) and has been filled with up to 10,000 to 15,000 feet of Tertiary[1] and Quaternary[2] period marine and terrestrial sediments (California DWR, 2004b). The Salinas Valley Groundwater Basin has been divided into four subareas referred to as the 180/400-Foot, East Side, Forebay, and Upper Valley Subareas or Subbasins, based on sources of recharge and stratigraphy (California DWR, 2003; MCWRA, 2006, 2013). The subbasins in the project area are shown on **Figure 4.10-1**. The DWR has redesignated the previously named “Pressure” Subarea as the “180/400-Foot Aquifer” Subbasin, and this EIR section uses this updated terminology (California DWR, 2003). The 180/400-Foot Aquifer Subbasin also includes shallower (Dune Sand Aquifer along the coast and Perched “A” Aquifer inland) and deeper (900-Foot Aquifer) aquifers, as discussed below.

[1] Tertiary time is from 1.6 to 65 million years ago.
[2] Quaternary time is from the present to 1.6 million years ago.

180/400 Foot Aquifer Subbasin and Aquifers

The 180/400-Foot Aquifer Subbasin encompasses approximately 140 square miles, beginning at the coast and extending southeastward and inland to around the city of Gonzales. The hydrologic boundaries of the Subbasin are generally the East Side Subarea to the northeast, the Seaside Basin to the southwest, and the Pacific Ocean to the northwest at the coast. The northeastern boundary between the 180/400-Foot Aquifer Subbasin and East Side Subbasin is complex and is defined in recent studies as the transition from fluvial (180/400-Foot Aquifer Subbasin) to alluvial (East Side Subbasin) depositional environments (Kennedy/Jenks, 2004). As discussed in the groundwater flow section below, groundwater flow in the coastal area is currently eastward from the coast through the 180/400-Foot Aquifer Subbasin to the East Side Subbasin. This flow pattern has resulted in seawater intrusion in this area (MCWRA, 2012b).

The 180/400-Foot Aquifer Subbasin includes three primary aquifers: the 180-Foot Aquifer, the 400-Foot Aquifer, and the 900-Foot (Deep) Aquifer, named for the average depth at which they occur (Kennedy/Jenks, 2004; Geoscience, 2008). In addition, portions of the overlying Dune Sand deposits along the coast are saturated and are referred to as the Dune Sand Aquifer, although most of the water is saline[3] to brackish[4] due to proximity with the ocean and seawater intrusion (Kennedy/Jenks, 2004) and is consequently not used as a water supply. Also, the 180-Foot Aquifer is overlain by the Salinas Valley Aquitard, which is a fine-grained confining layer that extends fairly continuously throughout the 180/400-Foot Aquifer Subbasin. The Shallow Aquifer consists of relatively thin and locally discontinuous deposits of sand and silt overlying the Salinas Valley Aquitard.

Water-bearing geologic formations present within the 180/400-Foot Aquifers from shallow and younger to deeper and older include the Quaternary Alluvium (including the Dune Sands and Terrace Deposits), Aromas Sand, Paso Robles Formation, Purisima Formation, Santa Margarita Sandstone, and Monterey Formations. Not all geologic units are present in all areas.

The location of the 180-Foot Aquifer within the Salinas Valley Groundwater Basin is variable and spans more than one stratigraphic or geologic unit. Various interpretations have correlated the aquifer to different combinations of stratigraphic units depending on the investigator, the area under study, and the investigator's interpretation: lower Valley Terrace deposits and upper Aromas Sand by the DWR (2004a); the Paso Robles Formation by Kennedy-Jenks (2004); Valley Fill by Harding ESE (2001); and lower Valley Fill Upper Aromas Sands Formations by Green (1970). The 180-Foot Aquifer has been correlated with the lower portions of the Quaternary Alluvium and the upper portions of the Aromas Sand (California DWR, 2004b; Geoscience, 2008, 2013a, 2014a). The lenticular shapes of the sand and gravel bodies that make up the 180-Foot Aquifer indicate their fluvial (river) depositional origin with the more laterally extensive units representing fluvial channels that migrated and shifted over time (Kennedy/Jenks, 2004). The 180-Foot Aquifer has been geophysically mapped out into the Monterey Bay where the unit is open to the ocean several miles offshore (Green, 1970; Eittreim et al., 2000).

[3] Saline water is water that has the approximate salinity of seawater, about 35 parts per thousand or 35,000 parts per million.

[4] Brackish water is water that has more salinity than fresh water, but not as much as seawater. Thus, brackish water covers a range of salinity regimes and is not considered a precisely defined condition. The salinity of brackish waters can vary considerably over space and/or time.

180/400-Foot Aquitard

As shown on **Figure 4.10-2, Salinas Valley Groundwater Basin Conceptual Cross-Section in Project Vicinity**, the 180- and 400-Foot Aquifers are separated by the 180/400-Foot Aquitard (Kennedy/Jenks, 2004). The unit is commonly 50 to 100 feet thick, is in some areas as much as 200 to 250 feet thick, and may be absent in some areas.

400-Foot and 900-Foot Aquifers

The underlying 400-Foot Aquifer has been correlated with the Aromas Sand and the upper Paso Robles Formation (Geoscience, 2008). A blue marine clay separates the 400-Foot Aquifer from the underlying 900-Foot (Deep) Aquifer (California DWR, 2004b; Geoscience, 2008). The 900-Foot Aquifer has been correlated with the Paso Robles Formation, Purisima Formation, and Santa Margarita Sandstone (Yates et al., 2005).

East Side Subbasin and Aquifers

The East Side Subbasin is located inland to the northeast of the 180/400 Foot Aquifer Subbasin and encompasses about 125 square miles along the northeastern side of the Salinas Valley from Gonzales to east of Castroville. The hydrogeology and groundwater behavior is markedly different in the East Side Subbasin due to the different depositional environments and geology (Kennedy/Jenks, 2004). The transition zone between these subbasins has been defined based on the transition from predominantly alluvial deposits within the East Side Subbasin to the fluvial deposits that make up the 180- and 400-Foot Aquifers. The clay layers noted in the 180- and 400-Foot Aquifers pinch out moving inland into the East Side Subbasin. Although some previous investigators noted limited evidence for the designation of East Side Subbasin shallow and deep aquifer zones within the East Side Subbasin that generally correlated with the 180- and 400-Foot Aquifers, subsequent studies concluded that no evidence exists for a discrete confining layer that defines a deep and a shallow zone (Kennedy/Jenks, 2004). It is more likely that the degree of confinement increases with depth as a result of the interbedded nature of the stratigraphy. As noted above, the Salinas Valley Aquitard does not extend much into the East Side Subbasin (Durbin et al., 1978). Water-bearing formations present within the East Side Subbasin include Quaternary Alluvium (both alluvial fan and fluvial deposits), the Aromas Sand, and the Paso Robles and Purisima Formations (California DWR, 2004b).

The hydrologic boundaries of the East Side Subbasin are generally the 180- and 400-Foot Aquifers to the southwest, the Gabilan Range along the northeast, and a subarea referred to as the Forebay Subbasin to the south and southeast.

Salinas Valley Groundwater Basin Flow and Occurrence

A groundwater basin is much like a surface water reservoir. When water is removed from storage, the water level drops until the supply can be replenished by inflow or recharged by rainfall or stream flow. Recharge comes from the infiltration of water into the subsurface and the migration of water downward into the aquifers. Along the coast, recharge can also come from the ocean, which in some cases, results in the intrusion of seawater into coastal aquifers. When water is extracted from the basin, some inflows, from head-dependent boundaries such as the ocean and the Salinas River, increase and thereby tend to counteract the water-level decline.

Before extensive pumping began in the Salinas Valley, the regional groundwater flow was toward the coast from inland areas. Historical hydrogeologic studies have shown a regional decline in the groundwater table dating back to the 1920s, which resulted in a sea to land groundwater gradient in some coastal areas. Water-level data from existing wells within the 180-Foot Aquifer in the study area indicates that the direction of groundwater flow is from the ocean southeast toward the City of Salinas and when it reaches the City of Salinas area, groundwater in both the 180-Foot and 400-Foot Aquifers flows towards a groundwater depression north of Salinas (Geoscience, 2013).

Along the coast, flow in both the 180-Foot and 400-Foot Aquifers is inland and has resulted in seawater intrusion, as discussed in the section titled "Seawater Intrusion in the Salinas Valley Groundwater Basin" below.

Salinas Valley Groundwater Basin Recharge

Groundwater recharge in the Salinas Valley Groundwater Basin occurs due to percolation of rainfall, river and stream infiltration, and agricultural irrigation and other return flow, including enhanced groundwater recharge.[5] The capability of an overlying formation to provide a pathway for recharge depends on numerous factors. For example, recharge from direct percolation depends on the absence of near-surface confining and semiconfining clay layers that can impede the downward flow of water, as is the case in areas where the Salinas Valley Aquitard restricts the downward migration of water (see **Figure 4.10-2, Salinas Valley Groundwater Basin Conceptual Cross-Section**). Similarly, the amount of recharge from underflow depends on the hydrologic interconnections of the water-bearing formations, as well as groundwater extraction occurring in upgradient areas within the basins. Historically, groundwater withdrawal within the Salinas Valley Groundwater Basin has outpaced groundwater recharge of fresh water and has resulted in overdraft[6] and seawater intrusion conditions (Brown and Caldwell, 2014; California DWR, 2004b; MCWRA, 2012a, 2012b; Kennedy/Jenks, 2004; HydroMetrics WRI, 2013).

An accurate accounting of groundwater recharge for the Salinas Valley Groundwater Basin is difficult to compile due to its large size, variations of rainfall each season and the proactive management of recharge activities by the Monterey County Water Resources Agency (MCWRA, 2006). Using DWR basin boundaries, Bulletin 118 provided generalized estimates of groundwater recharge within the Salinas Valley Groundwater Basin and subbasins, of which the Seaside Area was considered a subbasin. DWR estimated the overall basin inflow at 532,000 acre-feet per year (AFY) in the mid-1990's (MCWRA, 2006). However, these estimates do not apply directly to the groundwater basins as they are currently defined and managed by Monterey County. The MCWRA has estimated that in the northern portions of the Salinas Valley, recharge is by infiltration along the channel of the Salinas River (30%) and its tributaries (20%), irrigation return water (40%), and infiltration and precipitation over the valley floor, subsurface inflow, and seawater intrusion (10%) (MCWRA, 2006).

Although many groundwater studies have been conducted throughout the Salinas Valley Groundwater Basin, a collective repository of annual groundwater recharge estimates for the Salinas Valley Groundwater Basin and subareas has not been developed. However, seawater intrusion has been a component of recharge since it was first detected in 1938. Landowners and local water and wastewater agencies have consistently responded to the problem over more than half a century with a series of measures, described below, designed to reduce or work around seawater intrusion:

[5] Enhanced recharge refers to projects that are intended to accelerate localized recharge such as infiltration basins.

[6] Groundwater overdraft occurs when the groundwater levels are lowered due to excessive pumping at a rate that is greater than natural recharge.

- Constructing Lake Nacimiento (capacity 377,900 AF) in 1957 and Lake San Antonio (capacity 335,000 AF) in 1967 to augment groundwater recharge to the Salinas Valley Groundwater Basin. Reservoir releases in summer percolate through the Salinas River bed, which helps supply water for pumping and elevates groundwater levels in the Upper Valley and Forebay Subbasins and indirectly helps to repel seawater intrusion at the coast. The operation of the reservoirs increases groundwater recharge by about 30,000 AFY (RMC, 2003).
- Drilling deeper wells in the coastal area—first to the 400-Foot Aquifer and then to the Deep Aquifer.
- Constructing the Salinas Valley Reclamation and Castroville Seawater Intrusion Projects to deliver recycled water to coastal cropland in lieu of pumping groundwater.
- Constructing the Salinas Valley Water Project to deliver surface water to coastal cropland in lieu of pumping groundwater. This project modified the operation of Nacimiento and San Antonio Reservoirs and installed an inflatable dam in the Salinas River near the coast to divert water for irrigation on nearby cropland.

The Castroville Seawater Intrusion Project (CSIP) is a program that has distributed recycled water from the MRWPCA service area since 1998 (MCWRA, 2006). Tertiary-treated recycled water is produced by the Salinas Valley Reclamation Plant at the MRWPCA Regional Treatment Plant, and delivered to agricultural users within the 180/400 Foot and East Side Subbasins of the Salinas Valley Groundwater Basin, thereby reducing groundwater extraction in those areas. This type of redistribution of water resources provides a form of in-lieu groundwater recharge by effectively reducing groundwater extraction in those areas of the basin that are part of the CSIP area. As of 2014, the CSIP was delivering approximately 15,300 AFY of recycled water to farm lands in the CSIP delivery area.

Additional measures to combat seawater intrusion will be needed in the future, and MCWRA is developing Phase II of the Salinas Valley Water Project, which will capture and use additional Salinas River flows.

Salinas Valley Groundwater Basin Extraction

Within Monterey County, groundwater is the primary source of water supply for municipal and agricultural use. Groundwater extraction is monitored closely and reported on an annual basis for groundwater basins. **Table 4.10-1, Groundwater Extraction Summary for the Salinas Valley Groundwater Basin** summarizes groundwater extraction within the northern Salinas Valley Groundwater Basin from 2008 to 2013.

Table 4.10-1
Groundwater Extraction Summary for the Salinas Valley Groundwater Basin

	2008	2009	2010	2011	2012	2013
180/400 Foot Aquifer Subbasin	130,139	121,165	103,544	105,172	113.898	117,242
Eastside Subbasin	108,696	98,988	91,300	89,052	95,543	97,622

All values in acre-feet (AF)
SOURCE: MCWRA, 2009, 2010, 2011, 2012, 2013, 2014

Salinas Valley Groundwater Basin Quality

In general, groundwater quality in the Salinas Valley Groundwater Basin is influenced by a number of factors including natural geochemical properties and flow within the different hydrogeologic formations, groundwater pumping and induced seawater intrusion, land use practices, and accidental releases of contaminants into the environment. For specific information regarding areas with contaminated soil and shallow groundwater see **Section 4.7, Hazards and Hazardous Materials**.

Seawater Intrusion in the Salinas Valley Groundwater Basin

Seawater intrusion is typically inferred when chloride concentrations detected in groundwater monitoring and production wells are greater than 500 milligrams per liter (mg/L) because these concentrations exceed the California Secondary Maximum Contaminant Level (MCL) for drinking water.[7] In Monterey Bay, there are offshore ocean outcrops of the 180-Foot and 400-Foot Aquifers a few miles offshore, as identified by Greene (1970). These ocean floor outcrops facilitate the recharge of seawater into those aquifers along the coast when groundwater extraction exceeds onshore recharge. More recent work by Eittreim, et. al., (2000) maps the Purisima Formation farther offshore than the locations of the 180-Foot Aquifer and 400-Foot Aquifer outcrops mapped by Greene. However, Eittreim did not specify correlations, if any, to specific aquifers, and Greene did not specify correlations to specific geologic units. In any case, various reports have confirmed that the 180-Foot and 400-Foot Aquifers do have ocean floor outcrops in Monterey Bay.

The offshore recharge area was investigated in a study that evaluated the mechanisms of seawater intrusion into the Salinas Valley Groundwater Basin, as based on the physical setting of the coastal portions of the aquifer systems and previous groundwater studies on seawater intrusions (Kennedy/Jenks, 2004). The study concluded that the core condition for seawater intrusion into the groundwater basin is the direct hydraulic contact of the aquifers with the Monterey Bay. The secondary condition for seawater intrusion into the 180-Foot and 400-Foot Aquifers is that inland groundwater levels are below sea level in some areas and the normal landward to seaward gradient has been reversed in the 180-Foot and 400-Foot Aquifers since the early 20th century.

Figures 2-9 illustrates the seawater intrusion areas as of 2011-2013 within the 180-Foot and 400-Foot Aquifers, respectively (MCWRA, 2014). The 2011 estimates of seawater intrusion within the 180-Foot and 400-Foot Aquifers indicate that seawater has intruded to a maximum of approximately eight miles and 3.5 miles inland, respectively, inferred from chloride concentrations greater than 500 mg/L. The seawater intrusion has resulted in the degradation of groundwater supplies, requiring urban and agricultural supply wells within the affected area to be abandoned or destroyed (MCWRA, 2001). Seawater intrusion in the Salinas Valley Groundwater Basin was first detected in 1938 and documented in 1946 when the State Department of Public Works (now known as DWR) published Bulletin 52 (California DWR, 2004b).

Additionally, as noted above, the Salinas Valley Groundwater Basin is hydrologically connected to the ocean, thus providing a constant source of both pressure and direct recharge of seawater. Because groundwater elevations along the coast and directly inland have been at or below sea level in the basin, a landward groundwater gradient has developed and induced groundwater recharge from the ocean. The consequence of the

[7] This value represents the Recommended Consumer Acceptance Contaminant Level Range pursuant to Title 22 of the California Code of Regulation, Section 64449(a).

overdraft conditions has led to degradation of groundwater quality along the coast within the Salinas Valley Groundwater Basin.

Salinas Treatment Facility: Existing Operations and Groundwater Relationship

Existing operations and infrastructure relevant to the proposed Salinas agricultural wash water diversion is described in this section, along with how those operations interact with groundwater conditions in the area. The City of Salinas (hereafter, Salinas) operates an industrial wastewater conveyance and treatment system that serves approximately 25 agricultural processing and related businesses located east of Sanborn Road and south of U.S. Highway 101. This wastewater collection system is completely separate from the Salinas municipal wastewater collection system and includes 14-inch to 33-inch diameter gravity pipelines that flow to the Salinas Pump Station Diversion site, and then flow into a 42-inch gravity pipeline to the Salinas Industrial Wastewater Treatment Facility (Salinas Treatment Facility). Over 80% of the wastewater flows in this system are from fresh vegetable packing facilities (typically, wash water used on harvested row crops). The remainder of flows originates from businesses associated with seafood processing, refrigerated warehousing, manufactured ice, preserves (frozen fruits, jams and jellies) and corrugated paper boxes. For purposes of this EIR, the wastewater is called agricultural wash water or wastewater. The agricultural wash water is conveyed in a pipeline that traverses near the Salinas Pump Station site to the Salinas Treatment Facility located adjacent to the Salinas River, downstream of the Davis Road crossing. The Salinas Treatment Facility consists of an influent pump station, an aeration lagoon, percolation ponds, drying beds, and rapid infiltration beds (or RIBs) to treat, percolate and evaporate the industrial wastewater.

All industrial wastewater entering the ponds passes through a bar screen at the influent pump station, which has a peak design flow of 6.8 mgd. The wastewater is treated using aeration then flows by gravity to three percolation ponds in series (from east to west, Ponds #1 through #3). Water levels must be maintained with no less than 1-foot of freeboard. These water levels are maintained by pumping to drying beds north of Pond 3 and to temporary rapid infiltration basins located between the ponds and the Salinas River. A conceptual process flow schematic of the Salinas Treatment Facility is shown in **Figure 2-13, Salinas Industrial Wastewater Treatment Facility Process Flow Schematic**, in **Chapter 2, Project Description,** and locations of existing infrastructure is shown in **Figure 2-14, Salinas Industrial Wastewater Treatment System Location Map**, in **Chapter 2, Project Description**. **Figure 4.10-3, Salinas Treatment Facility and Existing Vicinity Wells,** shows the locations of the ponds, rapid infiltration beds, drying beds, Salinas River, shallow monitoring wells at the Salinas Treatment Facility, and nearby irrigation wells.

The Salinas Treatment Facility operates year-round, with a peak monthly inflow during summer months of approximately 3.5 to 4.0 mgd. This summer peak corresponds with the peak agricultural harvesting season in the Salinas Valley. In recent years, substantial flows to the Salinas Treatment Facility have continued during the winter months due to the importation of agricultural products from Arizona for processing in the facilities that discharge wastewater to this system.

Baseline Conditions of the Salinas Treatment Facility related to Groundwater

The operating conditions and management of the Salinas Treatment Facility have shifted in recent years due to unusual conditions of high agricultural wash water flows in 2010 through 2013 and low and very low rainfall between 2012 and 2015. In addition, during 2014, the extreme drought and excess agricultural wash water flows led the City of Salinas, MCWRA, and MRWPCA to jointly pursue an emergency diversion (referred to as a “shunt”) of the untreated agricultural wash water to the Regional Treatment Plant in lieu of treatment and disposal of that water at the Salinas Treatment Facility. The shunt was conducted between April 1, 2014 and October 31, 2014 and during that time, agricultural wash water was routed to the Regional Treatment Plant for treatment and recycling for delivery to the CSIP area for crop irrigation.[8] In late spring and summer 2014, with no inflows to the Salinas Treatment Facility, the City of Salinas pumped the remaining wash water from main percolation/evaporation ponds (#1, #2, and #3) to the rapid infiltration beds that are between the ponds and the Salinas River to completely empty the ponds by July 2014. Prior to 2014, the ponds had not been emptied for maintenance of the pond bottoms for more than twelve years (i.e., since emergency repairs were completed in early 2002). As evidenced by the survey of the empty ponds in 2014, the ponds have accumulated silts from airborne particulate matter and waterborne suspended solids; the site is surrounded by agricultural operations that release particulate matter during periodic ploughing and other ground disturbance.

For the purpose of this section, the environmental setting for groundwater in the vicinity of the Salinas Treatment Facility is presented for two baseline scenarios or conditions, each of which is described and presented in full. One environmental baseline for this analysis is the existing conditions in 2013, which represents a reasonable estimate of conditions at the time of publication of the Notice of Preparation. Salinas Treatment Facility operations during 2013 differed from more typical conditions in two respects. First, 2013 was an extremely dry year, which resulted in atypical (i.e., greater than normal) pond evaporation. Second, inflows to the Salinas Treatment Facility have been increasing in recent years and the amount of agricultural wash water sent to the facility is projected to continue increasing in the future.

Another appropriate definition of baseline conditions for CEQA purposes would include agricultural wash water inflows anticipated at the time the Proposed Project goes on-line (assumed here to be 2017) and average rainfall and evaporation conditions. For these reasons, the second baseline scenario represents a condition that includes average rainfall and higher agricultural wash water flows that are reasonably assumed to occur in the year 2017 (the assumed first year of project operations).[9] In **Section 4.10.4**, the environmental impact analysis on groundwater resources of the Proposed Project is presented based on both of these baseline scenarios. That condition is described in the Approach to Analysis in **Section 4.10.4.2**, below. Both the 2013 existing conditions and the existing conditions on the first year of project operation (2017 existing conditions) are used in the analysis of operational impacts.

2013 Baseline Scenario for the Salinas Treatment Facility Water Balance

A diagram of flow routing among the Salinas Treatment Facility ponds is shown in **Figure 2-14, Diagram of Salinas Treatment Facility and Flows.** Salinas Treatment Facility operations interact with local groundwater and thus, a monthly water balance[10] of the existing Salinas Treatment Facility operations was conducted, using flows and storage changes during 2013 (Todd Groundwater, 2015c). Extra measurements of flow and quality

[8] During this same period (April through July 22, 2014), a small volume of secondary effluent from the Regional Treatment Plant was evaluated as influent to the Advanced Water Treatment Facility demonstration facility.
[9] Projections of future flows of agricultural wash water flows were conducted based on a linear regression analysis by Bob Holden, MRWPCA, in January 2014, which is provided in **Appendix B**.
[10] A water balance is a detailed tabulation of inflows, outflows, and storage changes for a defined hydrologic system.

in the Salinas River near the Facility during 2013 supported calculations related to the fate of water that currently percolates from the ponds.

In 2013, all agricultural wash water was sent to the Salinas Treatment Facility, and those flows were metered upon arrival. During the past ten or more years, the percolation ponds have been continuously full or nearly so, which has precluded normal maintenance activities such as drying and disking the pond bottoms. Consequently, percolation rates in Ponds #1, #2, and #3 have declined according to City staff. The ponds are approximately flat-bottomed and six to ten feet deep, which means that pond surface area remains relatively constant over most of the range of storage volumes.

Table 4.10-2, Monthly Salinas Treatment Facility Water Balance for 2013 presents a monthly water balance for the ponds and drying beds during 2013. Entries in the table are shown to three or four significant digits for arithmetic consistency. However, estimates of evaporation and percolation are probably accurate to only two significant digits. Accordingly, percolation and evaporation values extracted from the table are rounded in the text to two significant digits or the nearest ten acre feet (AF). Agricultural wash water inflow totaled 3,240 AF during 2013. Monthly rainfall is from the Salinas municipal airport station and is the same data used for urban runoff calculations in the Salinas River Inflow Impacts Report in **Appendix O**. Annual rainfall during calendar year 2013 was 3.3 inches, or 25% of the 1932 to 2013 average, making it the driest year in the 81-year period of record. The rainfall rate was multiplied by the combined area of all the ponds (118.4 acres, including the rapid infiltration beds) to obtain the volume of rainfall accretion to pond storage. Rainfall added about 50 AF to the ponds in 2013 but would add 200 AF in a year with normal rainfall. Evaporation was similarly estimated from reference evapotranspiration data.[11] Pond evaporation totaled 390 AF in 2013 and would be 360 AF in an average year.

The volumes of wastewater spread on the drying beds that are located north of Ponds #2 and #3 are not recorded. Due to poor drainage, 13 of the drying bed cells are not used, which corresponds to roughly ¼ of the 67-acre drying bed complex. Due to capacity constraints at the Salinas Treatment Facility, the remaining 75% of the drying bed area was more or less continuously wet throughout the year, and it was assumed that the per-area evaporation rate equaled the pond evaporation rate. Pond wastewater levels are also not routinely monitored. It was assumed that the net change in storage over the year was zero, given that the facility has been operating near capacity and that excess inflow is handled using the drying beds and rapid infiltration beds rather than by a long-term increase in pond storage. Finally, the overall percolation volume was obtained as the residual in the water balance and totaled 2,730 AF in 2013. The residual is the amount of percolation that, in combination with all other inflows and outflows, resulted in a no net change in pond storage between December 2012 and December 2013. The percolation rate from the ponds was assumed to be equal in all months.

[11] Reference evapotranspiration is typically about 75% of open-water evaporation from a Class A evaporation pan (Dunne and Leopold, 1979 as cited in Todd Groundwater, 2015c). However, evaporation from lakes is also less than pan evaporation because the larger surface area causes the adjacent air layer to become more saturated with moisture. The pan-to-lake coefficient is also typically about 75%, so evaporation from the ponds—which are the size of small lakes—can be approximated by reference evapotranspiration.

Table 4.10-2
Monthly Salinas Treatment Facility Water Balance for 2013[12]

Month	Agri-cultural Wash Water Inflow (AF)	Rainfall		Pond Evaporation		Drying Bed Evaporation (AF)	Pond + RIB + Drying Bed Percolation (AF)	Pond Storage (AF)
		Rate (in)	Volume (AF)	Rate (in)	Volume (AF)			
Dec-12								1,100
Jan-13	135	1.04	16	1.90	19	8	227	997
Feb-13	137	0.56	9	2.16	21	9	227	885
Mar-13	174	0.41	6	3.16	31	13	227	794
Apr-13	265	0.27	4	4.30	42	18	227	776
May-13	272	0.01	0	4.99	49	21	227	750
Jun-13	338	0.04	1	4.26	42	18	227	802
Jul-13	376	0.00	0	3.73	37	16	227	898
Aug-13	383	0.02	0	3.87	38	16	227	1,000
Sep-13	318	0.07	1	3.93	39	16	227	1,036
Oct-13	355	0.15	2	3.10	31	13	227	1,122
Nov-13	284	0.47	7	1.99	20	8	227	1,159
Dec-13	193	0.21	3	1.95	19	8	227	1,100
Total (AF):	3,231	3.26	50	39.34	388	165	2,729	
Percent of SIWTF outflow:					12%	5%	83%	

Notes: AF = acre-feet; RIB = rapid infiltration basin; Ponds 1-2-3 + RIB area = 106 acres; drying bed area = 67 acres; average percolation rate = 0.043 feet per day; aeration pond area = 12.4 acres, which is included in rain and evaporation but not percolation.

An important conclusion of the water balance analysis is that only 17% of Salinas Treatment Facility outflow was by evaporation at the ponds and drying beds during 2013. Therefore, it can be assumed that percolation is the primary means of wastewater disposal at this facility.

Water that percolates from the Salinas Treatment Facility ponds travels through the subsurface using two pathways: a short path from beneath the ponds to the Salinas River and a longer flow path into the shallow aquifer away from the river. These pathways are part of a complex three-dimensional groundwater flow system that interacts dynamically with water levels in the river and the Salinas Treatment Facility ponds. This system is portrayed in **Figure 4.10-4, Hydrogeologic Cross-Section of Salinas Treatment Facility**, which shows a cross-section through the Salinas Treatment Facility perpendicular to the river. In addition to water levels in the ponds and river, groundwater levels are shown for two of the eight monitoring wells located at the Facility. These wells monitor the shallow aquifer (A-Aquifer), which is discontinuously present and overlies the Salinas Valley Aquitard, which is

[12] Volumes in the table are shown in units of AF, which is customary for analysis of groundwater flow. The corresponding rates are acre-feet per month (AF/mo) or per year (AFY). Water and wastewater studies typically express volumes and rates in million gallons (mgal; 1 mgal = 3.069 AF) and million gallons per day (mgd). River flows are usually expressed in cubic feet per second (cfs; 1 cfs = 725 AFY = 0.65 mgd). This Draft EIR uses the units that are customary for the topic under discussion.

a fine-grained layer that restricts downward flow of water from the shallow aquifer to the 180-Foot Aquifer. The 180-Foot Aquifer is the shallowest aquifer used for water supply in the Salinas region. As its name implies, it is typically present at depths of approximately 180 feet below ground surface. It is underlain by the 400-Foot and Deep Aquifers, which are also used for water supply. Intervening fine-grained layers restrict flow between the aquifers. An average water level is shown on **Figure 4.10-4** for nearby wells that are screened in the 180-Foot Aquifer. The water surface elevations of the ponds are higher than the water surface of the river and shallow aquifer, and all three are higher than water levels in the 180-Foot Aquifer. Pond percolation creates a water-table mound that sends groundwater in all directions. The Salinas River is only 200 feet from the ponds along the entire 1.5-mile length of the Salinas Treatment Facility and has a much lower water surface; thus, a substantial percentage of percolated water is likely to flow subsurface to the river. Percolated water that disperses into the shallow aquifer is likely to percolate down to the 180-Foot Aquifer. Additional detailed analysis of this relationship is provided in **Appendix N**.

The subsurface flow of pond percolation into the Salinas River (also called seepage) is not routinely measured. However, two sets of measurements were made in October and November, 2013. These measurements used two different methods: (1) a water quality mixing model,[13] and (2) measurement of Salinas River flows upstream and downstream of the Salinas Treatment Facility during November 2013. The first estimate of pond seepage to the river (i.e., using a water quality mixing model) yielded a flow estimate of 3.67 cfs and the second (using river flow measurements) yielded 2.4 cfs. The average of the two estimates of seepage into the river was 3.0 cfs. If this rate were constant throughout the year (a reasonable assumption given the relatively constant surface area inundation of the ponds in 2013), it would amount to 2,170 AF of subsurface flow to the river, or 80% of total pond percolation during 2013. Percolation of water from the Salinas Treatment Facility to the shallow aquifer that does not seep to the Salinas River was determined to percolate downward and become recharge to the 180-Foot Aquifer by ruling out all other potential subsurface pathways. Therefore, 20% of percolated water from the Salinas Treatment Facility was estimated to recharge to the shallow (A-Aquifer) and ultimately to the180-Foot Aquifer and the amount of recharge in 2013 was estimated to be 550 AF. The assumptions and analysis of these estimates is provided in **Appendix N**.

2017 Baseline Scenario for the Salinas Treatment Facility Water Balance

As discussed previously, the 2013 water balance described in the previous section was not necessarily representative of normal existing conditions. Rainfall was extremely low that year, and inflows of agricultural wash water were less than the inflows expected at the time the Proposed Project operations would commence. Therefore, this EIR also includes a baseline scenario using a 2017 water balance reflecting normal climatic conditions and with the Salinas Treatment Facility inflows expected to occur when the Proposed Project operations would commence.

The 2017 baseline water balance is shown in **Table 4.10-3, Monthly Salinas Treatment Facility Water Balance for 2017**. Agricultural wash water inflows are expected to total

[13] MRWPCA personnel measured water quality in the Salinas Treatment Facility ponds and in the Salinas River at points upstream and downstream of the ponds on October 8, 2013. At that time, pond water was high in chloride relative to the river. Chloride is a conservative solute that tends to remain in solution without reacting, adsorbing or precipitating. It is commonly used in mixing model calculations. The amount of seepage from the ponds into the river was calculated by comparing the increase in chloride concentration in the river water along the Salinas Treatment Facility reach.

3,730 AF[14] in 2017. Monthly rainfall and evaporation rates are long-term averages from monitoring station data in Salinas. As in the 2013 water balance, it was assumed there would be no net increase in pond storage over the year. The assumed percolation rate was increased to achieve zero net storage change, and the relative proportions of seepage to the river and percolation to groundwater were assumed to be the same as in the 2013 water balance. The resulting estimate of seepage into the river is 2,730 AF (80% of 3,730 AF), and the estimate of percolation to the 180-Foot Aquifer is 680 AF (20% of 3,730 AF). In summary, more total percolation from the Salinas Treatment Facility would be expected to occur in 2017 than under 2013 conditions, due to the additional inflows (agricultural wash water and rainfall onto the site) to the facility (3,416 AF compared to 2,729 AF). Similarly, seepage to the river was estimated to be higher (2,730 AF in the 2017 baseline case, compared to 2,170 AF in the 2013 baseline case), and recharge to the groundwater basin was higher (680 AF in the 2017 baseline case compared to 550 in the 2013 baseline case).

Table 4.10-3
Monthly Salinas Treatment Facility Water Balance for 2017

Month	Agri-cultural Wash Water Inflow (AF)	Rainfall		Pond Evaporation		Drying Bed Evaporation (AF)	Pond + RIB + Drying Bed Percolation (AF)	Pond Storage (AF)
		Rate (in)	Volume (AF)	Rate (in)	Volume (AF)			
DEC								1,100
JAN	156	2.62	40	1.21	12	5	285	995
FEB	158	2.35	36	1.54	15	6	285	883
MAR	201	2.11	33	2.88	28	12	285	791
APR	307	1.10	17	4.08	40	17	285	773
MAY	311	0.30	5	4.56	45	19	285	740
JUN	391	0.08	1	5.16	51	22	285	775
JUL	435	0.02	0	4.47	44	19	285	863
AUG	444	0.04	1	4.30	42	18	285	962
SEP	367	0.17	3	3.20	32	13	285	1,002
OCT	410	0.57	9	2.75	27	12	285	1,098
NOV	329	1.41	22	1.50	15	6	285	1,143
DEC	223	2.35	36	1.23	12	5	285	1,100
Total (AF):	3,732	13.12	203	36.88	364	154	3,416	
Percent of Salinas Treatment Facility outflow:					9%	4%	87%	

Notes: AF = acre-feet; RIB = rapid infiltration basin; Ponds 1-2-3 + RIB area = 106 acres; drying bed area = 67 acres; wash water inflows are the expected amounts in 2017; rainfall and evaporation are long-term averages; percolation rate = 0.054 feet per day; aeration pond area = 12.4 acres, which is included in rain and evaporation but excluded from percolation.

4.10.2.4 Seaside Basin and Study Area

The Proposed Project Injection Well Facilities would be located within a portion of the Seaside Subbasin of the Salinas Valley Groundwater Basin as defined by DWR Bulletin 118

[14] This is a rounded number compared to Source Water Spreadsheet analyses in Appendix B that assume 3,732 AFY.

(California DWR, 2004a). The boundaries of the Seaside Subbasin and delineation of four subareas within the subbasin have been redefined by Yates et al. (2005) based on a reinterpretation of geologic faulting and groundwater flow divides. The northern boundary is based on a groundwater divide that is subject to movement with changing conditions in groundwater levels (Yates, et al., 2005; HydroMetrics WRI, 2009).

The revised subbasin covers about 20 square miles and is referred to as the Seaside Basin in this report. The boundaries of the Seaside Basin and four subareas are shown on **Figure 4.10-5, Seaside Groundwater Basin**. Production and monitoring wells, including inactive wells, are also shown on the figure to illustrate areas of groundwater development.

The Proposed Project Injection Well Facilities would be located within the northeastern-most subarea of the Seaside Basin, referred to as the Northern Inland Subarea. The site is close to the Northern Coastal Subarea where most of the basin's groundwater pumping occurs (as indicated by the relatively large number of wells on **Figure 4.10-5**). Groundwater production also occurs in the Southern Coastal Subarea and the Laguna Seca Subarea.

Historically, only minimal pumping has occurred within the Northern Inland Subarea. Of the three wells in the subarea shown on **Figure 4.10-5**, only one well - the City of Seaside Reservoir well - has provided water supply. The other two wells in the Northern Inland Subarea are monitoring wells. The subarea has remained largely undeveloped as a result of its long-term use as a large firing range by the U.S. Army on the former Fort Ord military base, which closed in 1994.

The southern subareas are considered less hydraulically connected to the Proposed Project area due to geologic faulting and structure between the two areas, and are not included in the study area for the impact analysis. For the purposes of the environmental setting information and impact analysis of the operation of the Injection Well Facilities and associated CalAm extraction activities after the Proposed Project is implemented, the study area is defined as the Northern Inland and Northern Coastal subareas of the Seaside Basin shown on **Figure 4.10-5**.

Seaside Basin Groundwater Extraction

Groundwater pumping in the Seaside Basin provides water supply for municipal, irrigation (primarily golf courses), and industrial uses. Historically, about 70 to 80% of the pumping has occurred in the Northern Coastal Subarea, with additional pumping occurring in the Laguna Seca Subarea supplemented by small amounts in the Southern Coastal Subarea. CalAm is the largest pumper in the basin accounting for about 79% of the groundwater pumped in water year (WY[15]) 2013 (Hydrometrics, WRI).

Annual pumping in the Coastal subareas and total basin production over the last 20 years are shown on **Figure 4.10-6, Coastal and Basin-wide Groundwater Production**. Over this time period, production in the Coastal subareas has averaged about 4,000 AFY and total basin production has averaged about 5,000 AFY.

Prior to basin adjudication in 2006, pumping exceeded sustainable yield and contributed to significant basin-wide water level declines. Over-pumping in the coastal subareas resulted in water levels declining below sea level at the coast, placing aquifers at risk of seawater intrusion. In particular, basin pumping increased after a 1995 order by the SWRCB placed constraints on out-of-basin supplies.

[15] For the purpose of management of the Seaside Groundwater Basin, Water Year (WY) 2013 begins October 1, 2012 and ends September 30, 2013.

Since 2008, groundwater pumping in the basin has declined. Pumping in coastal subareas averaged about 4,505 AFY from 1996 through 2008, but has decreased to about 3,288 AFY from 2009 through 2013 (Watermaster production records). For comparison purposes, a natural safe yield for the coastal subareas of between 1,973 AFY to 2,305 AFY was established as part of the Seaside Basin adjudication (California Superior Court, 2006).

The production data in **Figure 4.10-6** do not include injection and recovery from the nearby Monterey Peninsula Aquifer Storage and Recovery Project (ASR Project), where about 2,300 AF of water have been injected and recovered from 2010 through 2012. See **Section 2.5.5, Project Description**, Monterey Peninsula Aquifer Storage and Recovery Project, for a detailed description of the ASR project.

Relevant Seaside Groundwater Basin Aquifer Characteristics

The Seaside Basin consists of semi-consolidated to consolidated sedimentary units overlying relatively low permeability rocks of the Miocene Monterey Formation and older crystalline rocks. The sedimentary units consist of deep marine sandstones of Tertiary age overlain by a complex Quaternary-age sequence of continental deposits and shallow Quaternary-age dune deposits. In general, the sedimentary units dip northward and thicken into the Salinas Valley. For a detailed description of the geologic setting of the Seaside Basin, see **Section 4.8, Geology, Soils and Seismicity**. For a more detailed description of geologic deposits and results of boring samples, refer to **Appendix L** of this EIR. The following describes the aquifers within the Proposed Project study area of the Seaside Basin.

Paso Robles Aquifer

Beneath the Aromas Sand is the Paso Robles Formation of Pliocene age. The formation is heterogeneous and contains interbeds of sand, silt, and clay mixtures (Yates et al., 2005). These continentally-derived deposits are discontinuous and difficult to correlate from well to well in the basin. The formation is saturated in the proposed Injection Well Facilities area (and coastal areas) and forms the shallow aquifer in the basin (referred to as the Paso Robles Aquifer herein). Several production wells downgradient of the proposed Injection Well Facilities area are screened (i.e., perforated such that they can extract water in at specific depths) in permeable units in the Paso Robles aquifer.

Aquifer Recharge

The Paso Robles Aquifer is recharged mainly from surface infiltration of precipitation (HydroMetrics WRI, 2014). The soil formation that makes up this aquifer meets the ground surface in the eastern portion of the basin enabling rainfall to infiltrate directly into the aquifer units (Yates, et al., 2005). In the proposed Injection Well Facilities area, recharge occurs by percolation through the surficial deposits of the Aromas Sand.

Aquifer Production

The Paso Robles Aquifer is less productive than the deeper Santa Margarita Aquifer, but is screened in several production and monitoring wells near the proposed Injection Well Facilities area. In particular, the Paso Robles Aquifer is screened in five production wells (Paralta, Ord Grove, PRTIW, MMP, and Seaside 4, shown on **Figure 4.10-7, Proposed Injection Wells and Existing Vicinity Wells**), all of which are located within about 1,000 feet west of General Jim Moore Boulevard. In addition, the Reservoir Well, located east of General Jim Moore Boulevard and north of Eucalyptus Road, is also screened in the Paso

Robles Aquifer. The Paralta and Ord Grove Wells are also screened in the deeper Santa Margarita Aquifer.

The contribution of the Paso Robles Aquifer to Seaside Basin production is not known with certainty but has been estimated by previous investigators. Yates et al. (2005) reported that an average of about 40% of the coastal area production came from the Paso Robles Aquifer in 2000 through 2003. However, with additional wells in the Santa Margarita Aquifer and changes in production over time, the current contribution from the Paso Robles Aquifer is estimated to be less. Recent analysis indicates that only about 10 to 20% of the basin pumping is from the Paso Robles Aquifer (HydroMetrics WRI, 2013).

Water Levels

Water levels in the Paso Robles Aquifer (as measured in the well called “MSC Shallow”) have fluctuated between about minus three feet below mean sea level to about six feet above mean sea level over the last 24 years. Water levels declined below sea level in the mid-1990s in response to increases in groundwater extraction. Most of the subsequent groundwater extraction occurred in the deeper Santa Margarita Aquifer and water levels in the Paso Robles Aquifer rose near the coast. Since that time, water levels in the MSC Shallow well have stabilized at about three to five feet above mean sea level. However, water levels remain below mean sea level farther inland where a pumping depression persists.

Figure 2-4, Seaside Groundwater Basin Groundwater Levels, in **Chapter 2, Project Description** shows the pumping depression by the closed contour of zero feet mean sea level (sea level) on the water level contour map (contours from HydroMetrics WRI, 2013). This map, representing water levels measured in July and August 2013, shows water levels below mean sea level covering an area of almost 1,000 acres (also covering about one-half of the Northern Coastal Subarea, see **Figure 2-4**). Groundwater flow in both the Northern Coastal and Northern Inland subareas is controlled by the depression. Shallow groundwater beneath the proposed Injection Well Facilities area flows west toward the center of the depression where water levels are lower than minus 40 feet below mean sea level.

Figure 2-4 also shows that the water levels in the adjacent Southern Coastal Subarea are not significantly influenced by the pumping depression. In addition, groundwater flow patterns are altered near certain subarea boundaries where geologic faulting and other discontinuities have compartmentalized groundwater. In particular, the boundary between northern and southern subareas appears to impede groundwater flow. As pumping has lowered water levels in the northern subareas, changes in water levels and flow patterns across the boundary to the south have become more pronounced, with water levels in the southern subarea remaining higher and less influenced by pumping gradients.

Santa Margarita Aquifer

The Santa Margarita Sandstone of Pliocene/Miocene age underlies the Paso Robles Aquifer throughout most of the Seaside Basin. The aquifer consists of a poorly-consolidated marine sandstone approximately 250 feet thick in the Northern Coastal subarea of the basin. The unit has apparently been eroded near the southern basin boundary due to uplift from folding and faulting along the Seaside and Chupines Faults (Yates et al., 2005).

The Miocene/Pliocene Purisima Formation overlies the Santa Margarita Sandstone in some areas. This unit has been described in more detail along the coast and has been grouped with the Santa Margarita Aquifer in a layer of the basin groundwater model (HydroMetrics

WRI, 2009). The Purisima Formation is difficult to delineate using subsurface data and is either thin or not present beneath the proposed Injection Well Facilities area.

The Santa Margarita Aquifer is shown on the cross section on **Figure 2-33, Injection Well Cross Section** in **Chapter 2, Project Description**. The Santa Margarita Aquifer has been documented to be more homogeneous in nature. The aquifer is approximately 280 feet thick in the proposed Injection Well Facilities area and contains about 74% sand (with the remainder containing sandy silt and minor clay). The aquifer is about 600 feet deep in the proposed Injection Well Facilities area as indicated on **Figure 2-33**.

Aquifer Recharge

Most of the recharge to the Santa Margarita Aquifer is assumed to occur by leakage from the overlying Paso Robles Aquifer, especially in areas where the lower part of the Paso Robles Aquifer is relatively permeable (Yates, et al., 2005; HydroMetrics WRI, 2009). Recharge also enters the Santa Margarita Aquifer from subsurface inflow from other subareas and north of the basin boundary. Although the Santa Margarita Aquifer meets the ground surface (i.e., crops out") east of the Seaside Basin, recharge occurring in the outcrop area has been interpreted to flow with groundwater toward the Salinas Valley away from the Seaside Basin.

Aquifer Production

Coastal pumping in the Santa Margarita Aquifer was estimated to average about 2,500 AFY from 1999 to 2003, or about 60% of the coastal subarea production. Recent changes in wells and production intervals indicate that this percentage has increased. Basin-wide, the total production from the Santa Margarita Aquifer is estimated to be about 80% (HydroMetrics WRI, 2013).

Water Levels

Water levels have declined in the Santa Margarita Aquifer at a much faster rate than in the Paso Robles Aquifer. The potentiometric surface of the semi-confined Santa Margarita Aquifer indicates a long-term decline in water levels in the MSC Well since the mid-1990s with only seasonal recovery. The high rate of decline is likely related to both the increase in Santa Margarita Aquifer pumping as well as the lower storage ability of the semi-confined aquifer compared to the overlying unconfined Paso Robles Aquifer. In general, the rate of decline has been less since about 2006 as a result of the adjudication of the groundwater basin and subsequent changes in pumping rates. Nonetheless, water levels have been below sea level in coastal wells since 1995, increasing the risk of seawater intrusion.

Water levels in the nearby Paralta Test Well are generally higher than in FO-7 (which is up gradient of the proposed Injection Well Facilities and existing production wells), likely due to the well screens installed in both the Paso Robles and the Santa Margarita Aquifers. Although the trends and fluctuations in the Paralta Test Well correlate better with the Santa Margarita Aquifer water levels, the higher water levels from the Paso Robles Aquifer compared to the Santa Margarita Aquifer create higher overall composite water levels in the Paralta Test Well. Water levels in the Paralta Test Well also show greater seasonal fluctuations than observed in FO-7 due to its proximity to large pumping wells.

Figure 2-4 shows the widespread area of water level declines on a recent water level contour map for the Santa Margarita Aquifer (contours from HydroMetrics WRI, 2013). The map shows that water levels are below mean sea level over almost all of the Northern Coastal Subarea and a large portion of the Northern Inland Subarea. The lowest water levels are below minus 40 feet mean sea level, similar to the low levels in the Paso Robles

Aquifer. Water levels beneath the proposed Injection Well Facilities area range from about minus ten feet mean sea level to about minus 30 feet mean sea level.

Similar to groundwater conditions in the Paso Robles Aquifer, the Santa Margarita Aquifer water levels in the Southern Coastal Subarea do not appear to be controlled by the pumping depression to the north.

Seaside Basin Water Quality Characterization

This section presents information about ambient groundwater quality for the Seaside Basin. The water quality characterization was prepared by Todd Groundwater (see **Appendix L,** Section 7.3). The characterization is based on available data, previous investigations, and new geochemical evaluations of existing geologic sediments in the Seaside Basin. The geochemical evaluations are presented more fully in the MRWPCA field program report, called the *Hydrogeologic Field Investigation: MRWPCA Monitoring Well 1 Installation, Groundwater Quality Characterization, and Geochemical Assessment* (Todd Groundwater, February 2015).

As discussed previously, the study area for groundwater impacts includes the area of the Seaside Basin that may be affected by operation of the Proposed Project Injection Well Facilities, the Northern Inland and Northern Coastal subareas of the Seaside Basin shown on **Figure 4.10-5, Seaside Groundwater Basin**. For the groundwater quality characterization, the focus of the study area is shown in **Figure 4.10-7, Proposed Injection Well Facilities and Existing Vicinity Wells** based on the areas within the groundwater study area where water quality has been and will continue to be monitored upon implementation of the Proposed Project in accordance with regulations to protect groundwater quality.

Water Quality Data Sources Used

Previous investigations on groundwater quality in the Seaside Basin were reviewed, including Fugro (1998), Yates et al. (2005), and HydroMetrics (2009). Also reviewed were recent reports developed for the Seaside Basin Watermaster that contain evaluations of potential seawater intrusion (HydroMetrics WRI, 2013), and the Seaside Basin Salt and Nutrient Management Plan, which includes ambient groundwater quality data including concentrations of total dissolved solids, nitrate, and other constituents (HydroMetrics WRI, 2014). Recent and historical groundwater quality data for the Injection Well Facilities area were provided by MPWMD and CalAm. These data were supplemented with recent data collected by Todd Groundwater in association with the MRWPCA field program. **Table 4.10-4, Sources of Groundwater Quality Data** provides a summary of the data sources and the types of water quality constituents that were included in the groundwater characterization. Data from a total of 18 existing wells were used to characterize the existing groundwater quality in the part of the Seaside Basin that could be affected by Proposed Project Injection Well Facilities operations. Following the table is a description of the groundwater monitoring programs from which the data were supplied.

Table 4.10-4
Sources of Groundwater Quality Data

Categories of Water Quality Parameters	Data Sources		
	MPWMD	CalAm	MRWPCA
Number of Wells	14	8	6
Time Period	1990-2012	2010-2013	2014
Anions	X	X	X
Metals (including major cations)	X	X	X
Conventional Chemistry Parameters	X	X	X

Chlorinated Pesticides and Polychlorinated Biphenyls (PCBs)	X	X	X
Nitrogen and Phosphorus Pesticides	X	X	X
Organic Analytes (including 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane (EDB), diquat, endothall, glyphosate)	X	X	X
Chlorinated Acids	X	X	X
Carbamates *(organic compounds derived from carbamic acids)*		X	X
Volatile Organic Compounds (VOCs)	X	X	X
Semivolatile Organic Compounds		X	X
Haloacetic Acids		X	X
Herbicides		X	X
Nitroaromatics and Nitramines (explosives)			X
Other (i.e., isotopes)			X

MPWMD Groundwater Quality Monitoring Program

MPWMD conducts a basin-wide groundwater monitoring program with support from the Seaside Basin Watermaster. Components of the program also serve as the monitoring program for the existing ASR Project. The data used in the characterization for this EIR included the Watermaster monitoring program data along with historical groundwater quality data dating back to 1990; data from 14 wells were used.

CalAm Production Well Monitoring

CalAm monitors the water quality from their production wells in the Seaside Basin in compliance with drinking water requirements per the California Code of Regulation, Title 22. These data were provided for eight production wells in the Proposed Well Injection Facilities area and included samples from 2010 through 2013.

MRWPCA Field Program

From December 2013 through February 2014, Todd Groundwater conducted a field program for MRWPCA in support of the Proposed Project (Todd Groundwater, February 2015). The program included, among other activities, installation and sampling of a new monitoring well (MRWPCA MW-1), and groundwater sampling from five additional wells in the Injection Well Facilities area including two upgradient monitoring wells (FO-7 Shallow and FO-7 Deep) that had not previously been sampled for groundwater quality. Wells sampled during the MRWPCA field program are summarized in **Table 4.10-5, Wells Sampled in 2013-2014 MRWPCA Field Program**.

Table 4.10-5
Wells Sampled in 2013-2014 MRWPCA Field Program

Well	Well Type	Screened Aquifer	Well Depth (feet, bgs)	Screen Interval (feet, bgs)
MRWPCA MW-1	Monitoring	Paso Robles	521	421 - 446; 466 - 516
FO-7 Shallow	Monitoring	Paso Robles	650	600 - 640
FO-7 Deep	Monitoring	Santa Margarita	850	800 - 840
PRTIW	Irrigation	Paso Robles	460	345 - 445
ASR MW-1	Monitoring	Santa Margarita	740	480 - 590; 610 - 700
Seaside Muni 4	Production	Santa Margarita	560	330 - 350; 380 - 420; 430 - 470; 490 – 550
Notes: All wells sampled January/February 2014. bgs = below ground surface				

.An expanded list of water quality constituents was analyzed in the MRWPCA field program samples, compared to the list of constituents and data available from monitoring at other basin wells and shown in **Table 4.10-5**, and included:

- chemicals (including explosives) associated with former Fort Ord activities
- constituents contained in the California Drinking Water Regulations, and those relevant to the SWRCB Recycled Water Policy and Anti-Degradation Policy
- constituents of emerging concern (CECs) included in the SWRCB Recycled Water Policy (see Section 4.10.3.2 for discussion of this Policy)
- water parameters that define chemistry (chemical speciation or isotopic characteristics) of various waters to support hydrogeologic quality analysis and to analyze the compatibility of the Proposed Project purified recycled water with ambient groundwater

Laboratory analyses of groundwater samples collected at these six wells are presented in **Appendix L** (as Tables D-1 through D-7).

Water Quality Database/Accuracy

Data sets from the sources described above were compiled into a database. This database was used to characterize groundwater quality and identify potential constituents of concern for the Proposed Project water quality impacts assessment. In addition, the available data representing general groundwater chemistry were checked for accuracy and then evaluated using various geochemical techniques, the assumptions, methodology, and results of which are summarized in Section 7.3.2 in the Todd Groundwater Report in **Appendix L**.

Water Quality Characterization Key Findings

The existing water quality of the Seaside Basin in the area potentially affected by Proposed Project Injection Well Facilities operations was characterized using the existing water quality monitoring data available from the sources identified above, along with the results of MRWPCA's field program sampling and analysis performed specifically for the Proposed Project. This characterization is summarized below by constituent. Where applicable, the relevant water quality regulatory standard or advisory level for the constituent is discussed.

General Groundwater Chemistry

The general chemistry of the groundwater in the Seaside Basin was characterized to evaluate subsurface interactions related to water chemistry, accuracy of other water sampling and analysis, and to understand possible sources of groundwater recharge and sources. The general chemistry parameters included cations (calcium, magnesium, sodium, potassium) and anions (chloride, sulfate, bicarbonate and carbonate). Various graphical representations are provided within **Appendix L** to demonstrate how different sources of water have different chemical properties. Regarding the evaluation of accuracy of the water quality analyses of groundwater samples, the evaluation of the general chemistry data found that most water quality samples had acceptable limits for both the cation/anion ratio and the charge balance; thus demonstrating good accuracy. Some wells resulted in data slightly outside of the accuracy limits (e.g., samples from Darwin, FO-7 Shallow, PRTIW Mission, ASR-2, ASR-3, Seaside Middle School, and Ord Grove) and one groundwater sample (from FO-7 Shallow) was associated with elevated turbidity that has likely interfered with the metals analytical data and has potentially impacted the accuracy of other water quality results from that well.

Total Dissolved Solids

The concentration of total dissolved solids (a measurement of salinity of water) in groundwater is used for identifying suitability of the groundwater for potable and irrigation uses, and for identifying the presence or potential for seawater intrusion to affect the use of groundwater in coastal basins. **Figure 4.10-8, Total Dissolved Solids in Groundwater near Injection Well Facilities,** shows a map of recent (2012 to 2014) total dissolved solids concentration ranges for the samples from the water quality characterization.

Figure 4.10-8 indicates that all of the total dissolved solids measurements in the wells were below the California Secondary MCL Upper Consumer Acceptance Contaminant Level Range of 1,000 mg/L, although some were above the Recommended Consumer Acceptance Contaminant Level Range of 500 mg/L. Total dissolved solids levels ranged from 190 mg/L in FO-7 Shallow (Paso Robles Aquifer) to 668 mg/L in ASR-2 (Santa Margarita Aquifer). In general, wells screened in the Paso Robles Aquifer have lower total dissolved solids concentrations than in the Santa Margarita Aquifer, with the 500 mg/L level serving as a reasonable dividing concentration for comparative purposes. For example, all wells screened only in the Paso Robles Aquifer are below 500 mg/L (green on **Figure 4.10-8**). Most of the Santa Margarita wells have recent concentrations above 500 mg/L (yellow on Figure **4.10-8**), except Paralta (screened in both aquifers), SMS Deep, ASR-3, and FO-7 Deep. The wells did not show a wide variation in total dissolved solids concentrations over time.

Constituents of Concern and Other Groundwater Analyses

The water quality database was reviewed for more than 300 constituents/parameters, which are defined for purposes of this EIR as regulated constituents (those with MCLs), those with drinking water advisory levels, and constituents associated with former military activities at Fort Ord.[16] In addition to regulated constituents and former Fort Ord constituents, the MRWPCA field program groundwater samples were also analyzed for constituents of emerging concern (CECs), as defined in the SWRCB Recycled Water Policy, and other constituents not previously monitored routinely in local groundwater. The following is a discussion of these constituents.

Constituents Exceeding California Primary MCLs

In general, the background sampling indicated high quality groundwater in the basin. Of the more than 300 constituents and parameters analyzed in each of the six wells for this monitoring event (a total of about 1,800 sample analyses), all met primary drinking water standards except for a few constituents in two monitoring wells. Specifically, all concentrations for 100 constituents analyzed with a primary MCL were found to the regulatory limit, except for eight constituents in two wells that were apparently impacted by sample turbidity as discussed below.

Table 4.10-6, Constituents Exceeding California Primary MCLs summarizes all of the constituents that appear to exceed the California primary drinking water MCLs. As shown in **Table 4.10-6**, only two wells contained any exceedances. These exceedances involved five metals and three radiogenic parameters (i.e., measurements of radioactivity), all naturally-occurring constituents associated with subsurface sediments. These constituents are also

[16] The current and intended use of the groundwater is for municipal supply, not agricultural supply as documented in the Salt and Nutrient Management Plant (HydroMetrics WRI, 2014). Based on this, the background groundwater quality assessment for the Seaside Basin was not extended to include agricultural objectives and guidelines.

the types most affected by elevated turbidity in groundwater samples. As shown on the table, the exceedances in samples from the two wells, FO-7 Shallow and MRWPCA MW-1, correlate to elevated turbidity values of 550 Nephelometric Turbidity Units (NTU) and 71 NTU, respectively. For comparison purposes, all other turbidity levels in the remaining wells were 10 NTU or less. Elevated turbidity in groundwater samples result from small particles of aquifer material (or pre-development solids from drilling fluids) being entrained into the sample, where they interfere with laboratory analysis. The elevated concentrations of metals and radiogenic parameters detected in these wells are likely being measured in the solids of the aquifer materials and not in dissolved groundwater.

Table 4.10-6
Constituents Exceeding California Primary MCLs

Analyte	Method	Units	MDL	FO-7 Shallow	MRWPCA MW-1	California Primary MCL
Turbidity	**SM2130B**	**NTU**	**0.040**	**550**	**71**	**5***
Aluminum (Al)	EPA 200.8	µg/L	8.0	3,700	2,700	1,000
Arsenic (As)	EPA 200.8	µg/L	0.28	210		10
Barium (Ba)	EPA 200.8	µg/L	0.12	1,200		1,000
Chromium (Cr) Total	EPA 200.8	µg/L	0.32	790		50
Lead (Pb) Total	EPA 200.8	µg/L	0.080	42		15
Gross Alpha	7110B	pCi/L	3.00	125 ±5		15
Gross Beta	7110B	pCi/L	4.0	114 ±2		50
Combined Radium	calculated	pCi/L	1.00	38.3 ±2.4		5

*5 NTU is a secondary MCL and is included on the table for comparison purposes
MDL = Method Detection Limit

Due to the relatively slow velocities within groundwater systems and the natural filtering associated with aquifer materials, groundwater does not typically contain solids, and as such, typically contains lower turbidity values than those in **Table 4.10-6** shown above. When aquifer particles or other solids are entrained in the groundwater samples (e.g., from a poorly-developed well), laboratory analyses typically indicate elevated metals, radiogenic parameters, or other constituents associated with these solids.

The 2014 sampling event represents the first time that either of these two wells had been sampled for water quality. For FO-7 Shallow, it was the first time that this small-diameter monitoring well had been sampled for water quality since its original sampling in 1994. Sampling produced a highly turbid sample (550 NTU), likely relating to the inability to properly develop the well when first installed as a water level monitoring well. As such, it is reasonable to expect that the analysis of some constituents would be compromised and not representative of actual groundwater concentrations.

The concentrations of certain metals and radiogenic parameters shown in the table are not representative of actual concentrations in groundwater. The small-diameter casings and deep water table have limited the ability to develop these three monitoring wells in order to produce a turbid-free groundwater sample for analysis. Accordingly, future sampling programs will incorporate standard techniques such as field filtering to minimize the effects of turbidity.

Former Fort Ord Constituents

Given the historical land use of the former Fort Ord lands, the MRWPCA field program included groundwater analyses for chemicals of concern associated with former Fort Ord activities. The six groundwater samples from the MRWPCA field program were analyzed for 17 explosive compounds (nitroaromatics and nitramines) by U.S. Environmental Protection Agency (EPA) Method 8330B. In addition, two metals associated with explosive compounds (beryllium and lead) were also analyzed. These data were compared to available California primary drinking water MCLs and California Notification Levels (NLs)[17] and are summarized in **Table 4.10-7, Groundwater Quality Results for Explosives and Associated Metals**.

Table 4.10-7
Groundwater Quality Results for Explosives and Associated Metals

Constituent	Wells with Detections*	Minimum Reporting Limit (RL)	Detected or Reported Concentration	California Primary MCL	California NL	Comments
		µg/L				
Explosives*						
HMX (cyclotetramethylene tetranitramine)	None	0.099-0.12	ND	None	350	
RDX (cyclotrimethylene trinitramine) (cyclonite)	None	0.099-0.12	ND	None	0.3	
1,3,5- TNB (trinitrobenzene)	None	0.20-0.22	ND	None	None	
1,3-dinitobenzene	None	0.098-0.12	ND	None	None	
3,5-dinitoaniline	None	0.098-0.30	ND	None	None	
TETRYL (2,4,6 trinitro-phenylmethyl-nitramine)	None	0.10-0.12	ND	None	None	
nitrobenzene	None	0.099-0.12	ND	None	None	
4-Amino-2,6-dinitrotoluene	None	0.098-0.11	ND	None	None	
2-amino-4,6-dinotrotoluene	None	0.098-0.11	ND	None	None	
2,4,6-trinitrotoluene (TNT)	None	0.098-0.11	ND	None	1	
2,6-DNT (dinitrotoluene)	FO-7 Shallow	0.20	0.070***	None	None	high turbidity
	FO-7 Deep	0.23	0.064***	None	None	slightly turbid
	ASR MW-1	0.10	0.037***	None	None	
2,4-DNT (dinitrotoluene)	None	0.10	ND	None	None	
2-nitrotoluene	None	0.11	ND	None	None	
4-nitrotoluene	None	0.098-0.12	ND	None	None	
3-nitrotoluene	None	0.098-0.12	ND	None	None	
NG (nitroglycerine) (triniroglycerol)	None	0.99-1.2	ND	None	None	
Pentaerythritol tetranitrate	None	0.49-0.56	ND	None	None	
Metals**						
Beryllium (Be)	ASR-2	0.050	0.7	4		
	FO-7 Shallow	0.020	0.68			high turbidity
	MRWPCA MW-1	0.020	0.044			turbid
Lead (Pb)	ASR-1	0.020	0.78	15		
	ASR-2	0.010	3.0			

[17] NLs are non-regulatory, health-based advisory levels established by the SWRCB Division of Drinking Water for contaminants in drinking water for which MCLs have not been established. A NL represents the concentration of a contaminant in drinking water that the Division of Drinking Water has determined does not pose a significant health risk, but warrants notification to the local governing body.

	FO-7 Shallow	0.020	**42.0**			high turbidity
	FO-7 Deep	0.080	1.3			slightly turbid
	PRTIW: Mission Memorial	0.020	0.061			
	MRWPCA MW-1	0.020	1.3			turbid
	Paralta	0.001	3.0			

Notes:
* Nitroaromatics and nitramines by EPA Method 8330B: Samples received and submitted by Alpha Analytical Laboratory, Ukiah, CA to ALS Environmental (ALS), Kelso, WA on February 5, 2014; analyzed by ALS on February 8, 2014.
****** Metals by EPA Method 200.8 analyzed by Alpha Analytical Laboratory, Ukiah, CA, February 5-11, 2014.
***Constituent also detected in laboratory blank indicating a laboratory contaminant that may not be present in groundwater. All detections were below Reporting Limits (J values) and are not quantifiable.
µg/L = micrograms per liter or parts per billion (ppb)
MCL = Maximum Contaminant Level for drinking water
ND = Not detected above the method detection level for any of the samples from the six wells.

As shown in **Table 4.10-7**, the only explosive constituent detected in groundwater samples was 2,6-DNT (dinitrotoluene). This constituent was also detected in laboratory blank samples, which are samples of laboratory water (not groundwater) analyzed for quality assurance/quality control (QA/QC) purposes. Detections of this constituent at similar levels in the laboratory blank sample indicate that 2,6-DNT is likely a laboratory contaminant and is not actually present in groundwater. Although the constituent may be present in several groundwater *samples*, the laboratory blank data suggest that it was introduced into the samples in the laboratory. Further, detections of 2,6-DNT in FO-7 Shallow, FO-7 Deep, and ASR MW-1 were below the laboratory reporting level (RL[18]), meaning that the concentration of 2,6-DNT in samples is too low to be quantified. Given the laboratory QA/QC data for 2,6-DNT, the low levels of the detections, and the absence of additional explosives in groundwater, data indicate that groundwater has not been impacted locally from explosives associated with former Fort Ord activities.

For the metals analysis, both beryllium and lead – as naturally occurring substances – were detected in several groundwater wells above the RLs. Beryllium was detected in groundwater collected from ASR-2, FO-7 Shallow, and MRWPCA MW-1, although all of the detections met the California Primary MCL for drinking water. Other wells in the database did not detect beryllium above the laboratory RLs.

Lead was also detected in groundwater collected from ASR-1, ASR-2, FO-7 Shallow, FO-7 Deep, Mission Memorial PRTIW, MRWPCA MW-1, and Paralta. The detection in FO-7 Shallow (42 µg/L) was above the MCL (15 µg/L), but appears anomalous with respect to other detections of lead in the database. The concentration in FO-7 Shallow of 42 µg/L is the highest concentration in the database by an order of magnitude, which included lead analyses from 13 wells sampled from 2011 through 2014. The second highest concentration was detected in ASR-2 at 3.0 µg/L (also included on **Table 4.10-7**). Except for FO-7 Shallow, all of the detections were below the MCL for lead.

As previously mentioned, the 2014 sampling of FO-7 Shallow was the first time that this small-diameter monitoring well had been sampled for water quality since its original sampling upon well completion. Sampling produced a highly turbid sample (550 NTU), likely relating to the inability to properly develop the well when installed in 1994 as a water level monitoring well. As such, the metals analytical data are likely the result of particle interference and are not likely representative of dissolved lead concentrations in groundwater. The general chemistry (geochemistry) provides additional evidence that particle interference resulted in accuracy problems in samples from this well.

[18] Also called the Minimum Reporting Level or MRL.

Given the absence of explosives and the relatively low levels of beryllium and lead (with the exception of FO-7 Shallow where data appear to be inaccurate as explained above), the data do not indicate that former Fort Ord activities have impacted groundwater in the existing wells near the Proposed Project Injection Well Facilities site.

Constituents of Emerging Concern

As defined in the SWRCB Recycled Water Policy, constituents of emerging concern (CECs) are chemicals in personal care products (PCPs), pharmaceuticals including antibiotics, antimicrobials, agricultural and household chemicals, hormones, food additives, transformation products and inorganic constituents. These chemicals have been detected in trace amounts in surface water, wastewater, recycled water, and groundwater. The Recycled Water Policy includes monitoring requirements for six CECs for subsurface application groundwater replenishment projects using recycled water, four of which are used as health-based indicators and others serving as performance-based indicators.

In addition to the Recycled Water Policy CECs, as part of the SWRCB regulations for groundwater replenishment projects with recycled water, a project sponsor must recommend CECs for monitoring in recycled water and potentially in groundwater in the project's Engineering Report. For injection projects that use recycled water that has been treated using reverse osmosis (RO) and an advanced oxidation process (AOP), like the Proposed Project, the monitoring requirements in the Recycled Water Policy only apply to recycled water prior to and after RO/AOP treatment (i.e., no groundwater sampling).

None of the CECs currently have regulatory limits. The Recycled Water Policy includes monitoring trigger levels (MTLs) for the four health-based CEC indicators and response actions to be taken by groundwater replenishment project sponsors based on monitoring results compared to the MTLs. The MTLs were based on Drinking Water Equivalent Levels (DWELs). A DWEL represents the amount of a CEC in drinking water that can be ingested daily over a lifetime without appreciable risk. The following CECs from the Recycled Water Policy are those with health-based indicators, treatment/performance based indicators, or both as indicated below in parentheses.

- 17-*β*-estradiol - steroid hormone (health-based indicator)
- Caffeine – stimulant (health-based and performance-based indicator)
- N-nitrosodimethylamine (NDMA) – disinfection byproduct (health-based and performance-based indicator) [Note: NDMA's current California NL is 0.01 µg/L]
- Triclosan – antimicrobial (health-based indicator)
- N,N-diethyl-metatoluamide (DEET) – ingredient in personal care products (performance-based indicator)
- Sucralose – food additive (performance-based indicator)

To provide baseline conditions for these CECs in the Seaside Basin, the six wells sampled in the MRWPCA field program were analyzed for the six CECs with advisory levels and other pharmaceuticals/PCPs included in EPA Laboratory methods 1625M and 1694 (APCI and ESI+). Groundwater samples were analyzed from ASR MW-1, City of Seaside 4, FO-7 Shallow, FO-7 Deep, PRTIW Mission Memorial, and MRWPCA MW-1. Full results are provided in **Appendix D**. Detections of the six CECs are summarized in **Table 4.10-8, Groundwater Sample Analyses for CECs**.

Table 4.10-8
Groundwater Sample Analyses for CECs

Constituent*	Wells with Detections**	Minimum Reporting Limit (RL)	Detected or Reported Concentration	Comments
		μg/L***		
NDMA (nitrosodimethylamine)	PRTIW (Mission Memorial)	0.002	0.0054	NL =0.01
17-β-estradiol	None	0.001	ND	
Triclosan	None	0.002	ND	
Caffeine	FO-7 Deep	0.001	0.0027	
	MRWPCA MW-1		0.0068	
DEET (n,n-diethyl-m-toluamide)	FO-7 Deep	0.001	0.0023	
	MRWPCA MW-1		0.0060	
Sucralose	None	0.005	ND	

Notes:
***** NDMA by EPA Method 1625M; 17-β-estradiol and triclosan by EPA Method 1694-APCI**;** caffeine, DEET, and sucralose by EPA 1694-ESI+.
****** Groundwater analyzed from wells ASR-1, City of Seaside 4, FO-7 Shallow, FO-7 Deep, PRTIW Mission Memorial, and MRWPCA MW-1.
*** Analyses reported on laboratory analytical data sheets in nanograms per liter (ng/L) or parts per trillion. Converted to micrograms per liter (μg/L) or parts per billion (ppb).
Samples received by Alpha Analytical Laboratory, Ukiah, CA; submitted to Weck Laboratories, Inc. (Weck), City of Industry, CA, on February 5, 2014; analyzed by Weck from February 11 to February 19, 2014.
MCL = Maximum Contaminant Level for drinking water.
ND = Not detected.
NL = Notification level.

As indicated in **Table 4.10-8**, NDMA was detected in groundwater collected from the PRTIW Well at 0.0054 μg/L (below the NL); caffeine was detected in FO-7 Deep and MRWPCA MW-1 at 0.0027 and 0.0068 μg/L, respectively (below the DWEL of 0.35 μg/L per Anderson et al., 2010). DEET was detected in FO-7 Deep and MRWPCA MW-1 at 0.0023 and 0.0060 μg/L, respectively (below the DWEL of 81 μg/L per Intertox, 2009). Estradiol (17-β), triclosan, and sucralose were not detected above RLs in groundwater collected from any of the six wells.

These data represent the first time that CECs have been analyzed in the Seaside Basin and serve as initial background data. The data will be confirmed through future groundwater sampling events that will support the monitoring program to be included in the Proposed Project's Engineering Report. Nonetheless, only a few constituents were detected at very low levels (all less than 0.01 μg/L) and the detected levels of these constituents meet advisory or safe health concentrations.

Local Anthropogenic Groundwater Contamination by Others

The California Department of Toxic Substances Control (DTSC) *EnviroStor* web site (www.envirostor.dtsc.ca.gov) and the SWRCB *Geotracker* web site (http://geotracker.waterboards.ca.gov) were searched to identify any potential industrial sites or activities that could contribute to groundwater contamination from previous site uses, spills, and/or chemical releases in the Injection Well Facilities area.

Both *EnviroStor* and *Geotracker* listed the 28,016-acre Fort Ord Military Reservation as an active Federal Superfund site and listed munitions as the contaminant of primary concern. Additionally, *Geotracker* identified two adjacent sites on the former Fort Ord lands as gasoline contamination sites: 1): the 14th Engineers Motor Pool, and 2) Building 511. These are active sites currently undergoing investigations and are located about 1.8 miles to the northeast of the proposed Injection Well Facilities site. However, both sites are outside of the Seaside Basin and are not a threat to groundwater in the Injection Well Facilities area.

Other contamination sites have been identified in the basin, including numerous leaking underground storage tank sites, but none were in the Proposed Project Injection Well Facilities area. Specifically, there were no existing contaminant sites identified in the area between Proposed Project injection locations and downgradient extraction wells. There are no existing groundwater contaminant plumes in the Seaside Groundwater Basin study area.

Seaside Basin Recharge and Overall Water Balance

The Salt and Nutrient Management Plan estimated the average rainfall to be 16.5 inches per year based on averaging measurements from the closest two climate stations (one in Salinas and one in Monterey) for Water Years 1959 through 2011. Runoff on the rolling hills collects in low areas and provides recharge to the Seaside Basin. The total amount of recharge due to deep percolation of rainfall is 2,258 AFY. The water balance for the Seaside Basin is presented in **Table 4.10-9, Seaside Basin Water Balance**, below (HydroMetrics WRI, 2014).

Table 4.10-9
Seaside Basin Water Balance

Water Balance Component	Northern Coastal	Northern Inland	Southern Coastal	Laguna Seca	Basin Total
Inflows (AFY)					
Precipitation	78	1,450	30	700	2,258
Groundwater Underflow					
From Onshore	2,850	0	450	180	180*
From Offshore	100	0	0	0	100
ASR Wells (Injection)	625	0	0	0	625
Water Distribution System Losses	411	0	21	46	478
Sewer Distribution System Losses	77	0	9	19	105
Septic Systems	0	0	5	22	27
Irrigation Infiltration					
Golf Courses	85	0	0	88	173
Landscaping	461	0	52	114	627
Recycled Water Irrigation	0	0	0	9	9
Storm Water	68	0	37	0	105
Total Inflow	***4,754***	***1,450***	***604***	***1,177***	***7,985***
Outflows (AFY)					
Groundwater Pumping	4,278	0	227	869	5,374
Groundwater Underflow					
To Onshore	0	2,060	790	450	0*
To Offshore	70	0	30	0	100
Total Outflow	***4,348***	***2,060***	***1,047***	***1,319***	***8,774***
Storage Change (Inflow - Outflow)	**406**	**-610**	**-443**	**-142**	**-789**

* This value is not equal to the sum of the four subarea columns; it is a summary for the entire basin which is made up of all four subareas combined. The subarea columns are a summary of the water balance for each subarea. The four subarea columns include exchanges of groundwater between subareas, as they are an important source of loading and removal of salts and nutrients for individual subareas. The basin-wide value, however, only considers inputs to or outputs from the entire basin. The net values (total groundwater inflow less total groundwater outflow) derived from each approach are equivalent.

4.10.3 Regulatory Framework

4.10.3.1 Federal

Federal Safe Water Drinking Act

The Federal Safe Drinking Water Act allows the EPA to promulgate national primary drinking water standards specifying MCLs for each contaminant present in a public water system with an adverse effect on human health, taking into consideration cost and technical feasibility. Primary MCLs have been established for approximately 90 contaminants in drinking water. In cases where the maximum contaminant levels cannot be feasibly ascertained, the EPA may elect to identify and establish a schedule of "treatment techniques" preventing adverse effects on human health to the extent feasible. EPA also adopts secondary MCLs as non-enforceable guidelines for contaminants that may cause cosmetic or aesthetic effects. States have the discretion to adopt them as enforceable standards.

Primary drinking water MCLs are established in two steps. The EPA establishes maximum contaminant level goals. The maximum contaminant level goals have been historically set at zero for microbial and carcinogenic contaminants. Once the maximum contaminant level goal is established, the EPA determines the feasible maximum contaminant level or treatment technology level that may be achieved with the use of the best available technology and treatment techniques, and taking cost into consideration.

There are also a variety of chemicals of health concern whose occurrence is too infrequent in conventional drinking water sources to justify the establishment of national standards, but are addressed using advisory levels. The EPA establishes health advisories to address many of these latter chemicals.

Environmental Protection Agency Injection Well Registration

The EPA administers the Underground Injection Control (UIC) Program, which contains requirements for various classes of injection wells in the state. The Injection Well Facilities associated with the Proposed Project would be designated as Class V wells under the UIC program. Any injection project planned in California must meet the State Sources of Drinking Water Policy, which ensures protection of groundwater quality for drinking water supplies, and therefore an EPA UIC permit would not be necessary. Prior to operation, the Proposed Project wells must be registered on the UIC injection well database maintained by EPA.

4.10.3.2 State

Sustainable Groundwater Management Act

On September 16, 2014, Governor Edmund G. Brown Jr. signed three bills – Assembly Bill (AB) 1739 by Assembly member Roger Dickinson and Senate Bills (SB) 1168 and 1319 by Senator Fran Pavley -- which create a framework for sustainable, local groundwater management for the first time in California history. The legislation allows local agencies to tailor groundwater sustainability plans to their regional economic and environmental needs. The legislation has the following two principles: (1) groundwater is best managed at the local or regional level, and local agencies should have the tools they need to sustainably manage their resources, including the necessary authority, better technical information and financial resources; and (2) the state may intervene temporarily when local or regional agencies cannot or will not manage their groundwater sustainably to ensure the protection of the groundwater basin and its users from overdraft, subsidence, and other problems.[19] This recent legislation has potential implications for management of the Salinas Valley Groundwater Basin. The Seaside Basin is subject to a court-ordered adjudication; therefore, would not be subject to many provisions of the Sustainable Groundwater Management Act (aside from annual reporting requirements).

[19] See Groundwater Legislation Implementation Fact Sheet, at grac.org/documents/2014/**Groundwater-Fact-Sheet**.pdf.

State Water Resources Control Board Policies Related to Groundwater

Anti-degradation Policies

California's anti-degradation policies are found in Resolution 68-16, Policy with Respect to Maintaining Higher Quality Waters in California, and Resolution 88-63, Sources of Drinking Water Policy.[20] They apply to both surface waters and groundwaters (and thus groundwater replenishment projects), protect both existing and potential beneficial uses of surface water and groundwater, and are incorporated into RWQCB Water Quality Control Plans (e.g., Basin Plans).

The Anti-degradation Policy requires that existing high water quality be maintained to the maximum extent possible, but allows lowering of water quality if the change is "consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated use of such water (including drinking), and will not result in water quality less than prescribed in policies." The Anti-degradation Policy also stipulates that any discharge to existing high quality waters will be required to "meet waste discharge requirements which will result in the best practicable treatment or control of the discharge to ensure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

Sources of Drinking Water Policy

The Sources of Drinking Water Policy (adopted as Resolution 88-63) designates the municipal and domestic supply (MUN) beneficial use for all surface waters and groundwater except for those waters: (1) with total dissolved solids exceeding 3,000 mg/L, (2) with contamination that cannot reasonably be treated for domestic use, (3) where there is insufficient water supply, (4) in systems designed for wastewater collection or conveying or holding agricultural drainage, or (5) regulated as a geothermal energy producing source. Resolution 88-63 addresses only designation of water as drinking water source; it does not establish objectives for constituents that threaten source waters designated as MUN.

Recycled Water Policy

The Recycled Water Policy was adopted by the SWRCB in February 2009. It was subsequently amended in 2013 with regard to CEC monitoring for groundwater replenishment projects. The Recycled Water Policy was a critical step in creating uniformity in how RWQCBs were individually interpreting and implementing the Anti-degradation Policy in Resolution 68-16 for water recycling projects, including groundwater replenishment projects such as the Proposed Project. The critical provisions in the Policy related to groundwater replenishment projects are discussed in the following subsections.

Salt/Nutrient Management Plans

In recognition that some groundwater basins in the state contain salts and nutrients that exceed or threaten to exceed Basin Plan groundwater objectives, and that some Basin Plans do not have adequate implementation measures to achieve compliance, the Recycled Water Policy includes provisions for managing salts and nutrients on a regional or watershed basis through development of Salt and Nutrient Management Plans (SNMP) rather than imposing requirements on individual recycled water projects (which had been the practice prior to adoption of the Recycled Water Policy). Unfavorable groundwater salt and nutrient conditions can be caused by natural soils, discharges of waste, irrigation using

[20] See http://www.swrcb.ca.gov/plans_policies/.

surface water, groundwater, or recycled water, and water supply augmentation using surface or recycled water (although treating the recycled water through reverse osmosis prior to application would typically prevent these unfavorable). The Recycled Water Policy recognizes that regulation of recycled water alone will not address these conditions.

SNMPs are to be developed for every groundwater basin/sub-basin by May 2014 (May 2016 with a RWQCB-approved extension). The SNMP must identify salt and nutrient sources; identify basin/sub-basin assimilative capacity and loading estimates; and evaluate the fate and transport of salts and nutrients. The SNMP must include implementation measures to manage salt and nutrient loadings in the basin on a sustainable basis and an anti-degradation analysis demonstrating that all recycling projects identified in the plan will collectively satisfy the requirements of Resolution No. 68-16. The SNMP must also include an appropriate cost effective network of monitoring locations to determine if salts, nutrients and other constituents of concern (as identified in the SNMPs) are consistent with applicable water quality objectives. The MPWMD and HydroMetrics prepared a SNMP specific to the Seaside Basin in 2014, but there has not been a SNMP prepared for the Salinas Valley Groundwater Basin (see **Section 4.10.3.3** for more information on the status and contents of the relevant SNMP).

Regional Water Quality Control Board Groundwater Requirements

The Recycled Water Policy does not limit the authority of a RWQCB to impose more stringent requirements for groundwater replenishment projects to protect designated beneficial uses of groundwater, *provided* that any proposed limitations for the protection of public health may only be imposed following regular consultation with the California DDW. The Recycled Water Policy also does not limit the authority of a RWQCB to impose additional requirements for a proposed groundwater replenishment project that has a substantial adverse effect on the fate and transport of a contaminant plume (for example those caused by industrial contamination or gas stations), or changes the geochemistry of an aquifer thereby causing the dissolution of naturally occurring constituents, such as arsenic, from the geologic formation into groundwater. These provisions require additional assessment of the impacts of a groundwater replenishment project on areas of contamination in a basin and/or if the quality of the water used for replenishment causes constituents, such as naturally occurring arsenic, to become mobile and impact groundwater.

Anti-degradation and Assimilative Capacity

Assimilative capacity is the ability for groundwater to receive contaminants without detrimental effects to human health or other beneficial uses. It is typically derived by comparing background ambient chemical concentrations in groundwater to the concentrations of the applicable Basin Plan groundwater quality objectives. The difference between the ambient concentration and groundwater quality objective is the available assimilative capacity.

The Recycled Water Policy establishes two assimilative capacity thresholds in the absence of an adopted SNMP. A groundwater replenishment project that utilizes less than 10% of the available assimilative capacity in a groundwater basin/sub-basin (or multiple projects utilizing less than 20% of the available assimilative capacity in a groundwater basin/sub-basin) are only required to conduct an anti-degradation analysis verifying the use of the assimilative capacity. In the event a project or multiple projects utilize more than the designated fraction of the assimilative capacity (e.g., 10% for a single project or 20% for multiple projects), the project proponent must conduct a RWQCB-deemed acceptable (and more elaborate) anti-degradation analysis. A RWQCB has the discretionary authority to allocate assimilative capacity to groundwater replenishment projects. There is a presumed assumption that allocations greater than the Recycled Water Policy thresholds would not be granted without concomitant mitigation or an amendment to the Basin Plan groundwater quality objective to create more assimilative capacity for allocation. Groundwater replenishment projects that utilize advanced treated recycled water will use very little to essentially none of the available assimilative capacity because of the high quality of the water.

Division of Drinking Water

California's drinking water program was originally created in 1915, when the California State Board of Health established the Bureau of Sanitary Engineering. In 1976, two years after the Safe Drinking Water Act was passed, California adopted its own safe drinking water act (contained in the Health and Safety Code) and adopted implementing regulations (contained in Title 22 California Code of Regulation). The state's act had two main goals: (1) to continue the state's drinking water program, and (2) to be the delegated authority (referred to as the "primacy") by the EPA for enforcement of the federal Safe Drinking Water Act. As required by the federal act, California's program must set drinking water standards that are at least as stringent as the EPA's standards. Each community water system also must monitor for a specified list of contaminants, and the findings must be reported to the state.

The DDW regulates public water systems, oversees water recycling projects, permits water treatment devices, supports and promotes water system security, and performs a number of other functions. DDW has adopted enforceable primary and secondary MCLs.[21] The MCLs are either based on the federal MCLs or as part of DDW's own regulatory process. For example, California has an MCL for perchlorate while there is no federal MCL. The MCLs take into account not only chemicals' health risks, but also factors such as their detectability and treatability, as well as costs of treatment. Health and Safety Code Section116365(a) requires a contaminant's MCL to be established at a level as close to its Public Health Goal (PHG) as is technologically and economically feasible, placing primary emphasis on the protection of public health. The Office of Environmental Health Hazard Assessment (OEHHA) established PHGs. They are concentrations of drinking water contaminants that pose no significant health risk if consumed for a lifetime, based on current risk assessment principles, practices, and methods. OEHHA establishes PHGs pursuant to Health and Safety Code Section116365(c) for contaminants with MCLs, and for those for which MCLs will be adopted.

Public water systems use PHGs to provide information about drinking water contaminants in their annual Consumer Confidence Reports. Certain public water systems must provide a report to their customers about health risks from a contaminant that exceeds its PHG and about the cost of treatment to meet the PHG, and hold a public hearing on the report.

There are also a variety of chemicals of health concern whose occurrence is too infrequent in conventional drinking water sources to justify the establishment of national standards, but are addressed using advisory levels. The DDW, with the assistance of OEHHA, has established NLs and Response Levels for that purpose.[22] If a chemical concentration is

[21] A comparison of EPA and California primary MCLs, see http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/MCLsEPAvsDWP-2014-07-01.pdf; California secondary MCLs are available at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/recentlyadoptedregulations/R-21-03-finalregtext.pdf.

[22] See http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.shtml

greater than its NL in drinking water, the utility that distributes the water must inform its customers and consumers about the presence of the chemical, and about health concerns associated with exposure to it. If a chemical is present in drinking water that is provided to consumers at concentrations greater than the Response Levels (10 to 100 times greater than the NL depending on the toxicological endpoint of the constituent), DDW recommends that the source be taken out of service.

Final Groundwater Replenishment with Recycled Water Regulations hereafter, referred to as "Groundwater Replenishment Regulations," went into effect June 18, 2014 (SWRCB, 2014). The overarching principles taken into consideration by DDW in developing the Groundwater Replenishment Regulations were:

- Groundwater replenishment projects are replenishing groundwater basins that are used as sources of drinking water.
- Control of pathogenic microorganisms should be based on a low tolerable risk that was defined as an annual risk of infection[23] from pathogen microorganisms in drinking water of one in 10,000 (10^{-4}). This risk level is the same as that used for the federal Surface Water Treatment Rule for drinking water.
- Compliance with drinking water standards for regulated chemicals.
- Controls for unregulated chemicals.
- No degradation of an existing groundwater basin used as a drinking water source.
- Use of multiple barriers to protect water quality and human health.
- Projects should be designed to identify and respond to a treatment failure. A component of this design acknowledges that groundwater replenishment projects inherently will include storage in a groundwater aquifer and include some natural treatment.

The key provisions of the Groundwater Replenishment Regulations that apply to subsurface application (e.g., the use of injection or vadose zone wells) that use 100% recycled water for application are summarized in **Table 4.10-10**.

Table 4.10-10
Summary of June 2014 Groundwater Replenishment Regulations

Control Mechanism	Requirements
Source Control	Entities that supply recycled water to a groundwater replenishment project must administer a comprehensive source control program to prevent undesirable chemicals from entering wastewater. The source control program must include: (1) an assessment of the fate of DDW and RWQCB-specified contaminants through the wastewater and recycled water treatment systems; (2) provisions for contaminant source investigations and contaminant monitoring that focus on DDW and RWQCB-specified contaminants; (3) an outreach program to industrial, commercial, and residential communities; and (4) an up-to-date inventory of contaminants.
Pathogen Control	To meet the low tolerable risk level (a basic principle of the regulations), pathogen reduction requirements have been established for treatment of recycled water similar to the approach used for drinking regulations. The Groundwater Replenishment Regulations require a project to achieve a 12-log enteric virus reduction, a 10-log *Giardia* cyst reduction, and a 10-log *Cryptosporidium* oocyst reduction using at least 3 treatment barriers. To ensure that a barrier is significant, each barrier must achieve at least 1.0-log reduction. No treatment process can be credited with more than a 6-log reduction. The log reductions must be verified using a procedure approved by DDW. Log reduction refers to the reduction of pathogenic microorganism concentrations on a log-scale (e.g., 3 logs is 99.9% removal). Failure to meet the specified reductions requires notification to DDW and RWQB, investigation, and/or discontinuation of recycled water use until a problem is corrected. Trussell et al. (2013) conducted an extensive review of the proposed pathogen reduction

[23] There is a difference between infection and disease. Infection, often the first step, occurs when a pathogen enters a body and begins to multiply. Disease occurs when the cells in the body are damaged as a result of the infection and signs and symptoms of an illness appear. Infection necessarily precedes disease, but infection typically only leads to disease in a fraction of cases. Many factors influence the infection-to-disease ratio.

Table 4.10-10
Summary of June 2014 Groundwater Replenishment Regulations

Control Mechanism	Requirements
	requirements in the Groundwater Replenishment Regulations and concluded that the assumptions used to derive the log reductions were conservative and provide a large factor of safety that likely reduces the actual risk of infection below the 10^{-4} level, particularly for control of the amount of a particular disease present in a community.
Nitrogen Control	To ensure protection of groundwater, the concentration of total nitrogen in recycled water must meet 10 mg/L before or after recharge. Failure to meet this value requires follow-up sampling, notification to DDW and RWQCB, and/or discontinuation of recycled water use until a problem is corrected.
Regulated Chemicals Control	The recycled water must meet drinking water MCLs as specified by the Groundwater Replenishment Regulations. Failure to meet MCLs requires follow-up sampling, notification to DDW and RWQCB, and/or discontinuation of recycled water use until the problem is corrected.
Unregulated Chemicals Control	Monitoring the concentrations and toxicities of thousands of potential organic compounds in any water supply would be an infeasible task. Control of unregulated chemicals for all groundwater replenishment projects using 100% recycled water is accomplished through criteria for full advanced treatment of the recycled water, limits for Total Organic Carbon (TOC) and performance of treatment for constituents of emerging concern (CECs). TOC is used as a surrogate for unregulated and unknown organic chemicals. For subsurface application projects (injection and vadose wells), the entire recycled water flow must be treated using RO and AOP. After treatment, the TOC in the recycled water cannot exceed an average of 0.5 mg/L. Specific performance criteria for RO and AOP processes have been included in the Groundwater Replenishment Regulations. Failure to meet the requirements established for a groundwater replenishment project results in notifications to DDW and RWQCB, response actions, and in some cases cessation of the use of recycled water.
Response Retention Time (RRT)	The intent of the RRT is to provide time to retain recycled water underground to identify any treatment failure so that inadequately treated recycled water does not enter a potable water system. Sufficient time must elapse to allow for: a response that will protect the public from exposure to inadequately treated water; and provide an alternative source of water or remedial treatment at the wellhead if necessary. The RRT is the aggregate period of time between treatment verification samples or measurements; time to make the measurement or analyze the sample; time to evaluate the results; time to make a decision regarding the appropriate response; time to activate the response; and time for the response to work. The minimum RRT is 2 months, but must be justified by the groundwater replenishment project sponsor.
Monitoring Program	Comprehensive monitoring programs are established for recycled water and groundwater for regulated and unregulated constituents.
Operation and Optimization Plan	The intent of the plan is to assure that the facilities are operated to achieve compliance with the Groundwater Replenishment Regulations, to achieve optimal reduction of contaminants, and to identify how the project will be operated and monitored.
Boundaries Restricting Locations of Drinking Water Wells	Project sponsors must establish a "zone of controlled well construction," which represents the greatest of the horizontal and vertical distances reflecting the underground retention times required for pathogen control or for the RRT. Drinking water wells cannot be located in this zone. Project sponsors must also create a "secondary boundary" representing a zone of *potential* controlled well construction that may be beyond the zone of controlled well construction, thereby requiring additional study before a drinking water well is drilled.
Adequate Managerial and Technical Capability	A project sponsor must demonstrate that it possess adequate managerial and technical capability to comply with the regulations.
Engineering Report	The project sponsor must submit an Engineering Report to DDW and RWQCB that indicates how a groundwater replenishment project will comply with all regulations and includes a contingency plan to insure that no untreated or inadequately treated water will be used. The report must be approved by DDW.
Reporting	Annual reports must be submitted to DDW, RWQCB, and groundwater providers downgradient of injection wells; the Engineering Report must be updated every 5 years.
Alternatives	Alternatives to any of the provisions are allowed if: the project sponsor demonstrates that the alternative provides the same level of public health protection; the alternative has been approved by DDW; and an expert panel has reviewed the alternative unless otherwise specified by DDW.
Public Hearing	The project sponsor must hold a public hearing for a groundwater replenishment project after DDW approves the Engineering Report; based on the Engineering Report, the hearing, and public comments, DDW issues a conditional approval letter to the RWQCB for inclusion in the Waste Discharge Requirements and/or Water Reclamation Requirements issued by the RWQCB. Thus, including the hearing for the RWQCB permit, there are two public hearings for a groundwater replenishment project. Should DDW obtain primacy for issuing groundwater replenishment permits, the RWQCB would provide recommendations and conditions for inclusion in the WDRs and/or WRRs and the SWRCB would hold the permit hearing.

Order No. 2003-0003-DWQ, Statewide General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality

SWRCB Order No. 2003-0003-DWQ established a statewide Waste Discharge Requirements order regulating certain wastes that are low volume discharges with minimal pollutant concentrations. The order allows these wastes to be discharged to land without the preparation of a Report of Waste Discharge. The order addresses the discharge of well development water, monitoring well purge water, and boring waste directly to the land surface so long as the discharge is in a controlled manner that does not result in erosion or other adverse effects. The Central Coast RWQCB General Order WQ-2011-0223, *Waste Discharge Requirements NPDES General Permit for Discharges with Low Threat to Water Quality*, and the Central Coast –RWQCB Resolution R3-2008-0010, *General Waiver for Specific Types of Discharges*, discussed further below, provide further details on how this would apply to the Proposed Project.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation within California and defines water quality objectives as the limits or levels of water constituents that are established for reasonable protection of beneficial uses. The SWRCB administers water rights, water pollution control, and water quality functions throughout the state, while the Central Coast RWQCB conducts planning, permitting, and enforcement activities. The California Water Code requires the RWQCB to establish a regional Basin Plan with beneficial uses of inland surface waters and groundwaters and the water quality objectives to protect those uses. A distinction is made in the Basin Plan between the terms "water quality objectives" and "water quality standards". Water quality objectives have been adopted by the RWQCB and, when applicable, extended as federal water quality standards. Water quality standards, pertain to navigable waters and become legally enforceable criteria when accepted by the EPA. Therefore, the Basin Plan forms the regulatory references for meeting state and federal requirements for water quality control. The Basin Plan incorporates the SWRCB Anti-degradation Policy and references other applicable policies, such as the Sources of Drinking Water Policy and the Recycled Water Policy as previously described. The Basin Plan requirements for the Proposed Project for the study areas are discussed below in the Local Regulations subsection.

The requirements in the California Water Code would apply to the proposed Salinas Treatment Facility Storage and Recovery, the Treatment Facilities at the Regional Treatment Plant, and the Injection Well Facilities because the changes in operations of the treatment facilities and the injection of purified recycled water would be required to comply with the Basin Plan objectives, discussed in the Local Regulations subsection further below.

4.10.3.3 Regional and Local

Central Coast RWQCB Basin Plan

The Central Coast RWQCB, under the authority of the California Water Code, is responsible for authorizing and regulating activities that may discharge wastes to surface water or groundwater resources. This authority includes adoption of Basin Plans (Section 13240) with beneficial uses and water quality objectives (both narrative and numeric) to reasonably protect those uses (Section 13050). The Basin Plan also establishes guidelines for water used for irrigation. The Basin Plan for the Central Coast was originally adopted in 1971 and was last amended in 2011.[24]

For the Seaside Basin, where the Injection Well Facilities would be constructed and the purified recycled water would be used for groundwater replenishment, the applicable

[24] See http://www.waterboards.ca.gov/rwqcb3/publications_forms/publications/basin_plan/.

beneficial uses for groundwater resources are: agricultural water supply (AGR), municipal and domestic water supply (MUN), and industrial use (IND). The Basin Plan has:

- General narrative groundwater objectives that apply to all groundwaters for taste and odor and radioactivity.
- For MUN beneficial uses - groundwater criteria for bacteria and DDW primary and secondary MCLs.
- For AGR beneficial uses - objectives to protect soil productivity, irrigation, and livestock watering and guidelines to interpret a general narrative objective to prevent adverse effects on the beneficial use.

Permit limits for groundwater replenishment projects are set to ensure that groundwater does not contain concentrations of chemicals in amounts that adversely affect beneficial uses or degrade water quality. For some specific groundwater sub-basins, the Basin Plan establishes specific mineral water quality objectives for total dissolved solids, chloride, sulfate, boron, sodium, and nitrogen. No specific numeric objectives have been established in the Basin Plan for the Seaside Basin for these constituents other than those with maximum contaminant levels.

The proposed new source water diversions to the Regional Treatment Plant and any impacts on tertiary recycled water would also be subject to Basin Plan for the Salinas Valley Groundwater Basin and Water Recycling Criteria in Title 22 Code of Regulation. The Salinas Valley Groundwater Basin has the same beneficial uses and water quality objectives as the Seaside Basin.

Integrated Regional Water Management Plans

Integrated regional water management (IRWM) in California was established by the DWR as a way to increase regional self-sufficiency by encouraging local water resource managers to take a proactive role in solving water management problems through collaboration with stakeholders to create innovative strategies and effective actions to achieve water management objectives. In the project study area there are two relevant IRWM regions: Greater Monterey County region and the Monterey Peninsula, Carmel Bay, and South Monterey Bay (Monterey Peninsula region). The most recent updates to the IRWM Plans for these regions were completed in 2013 and 2014.

The IRWM Plans follow the criteria established by 2012 Proposition 84 and 1E IRWM Guidelines, as amended through December 2013 (Guidelines) that establish the general process and criteria that DWR uses to implement each IRWM Grant Program. DWR designed the IRWM planning process to be consistent with the California Water Plan, the overarching document that integrates all regional planning efforts and provides a collaborative planning framework for elected officials, agencies, tribes, water and resource managers, businesses, academia, stakeholders, and the public to develop findings and recommendations and make informed decisions for California's water future. Decisions enhanced by the IRWM planning process include funding from DWR and other agencies authorized by state Propositions, including Propositions 50 (passed by voters in 2002), 84 and 1E (passed in 2006), and the recent Water Bond, Proposition 1 (passed in 2014).

Local Salt and Nutrient Management Plans

As part of SWRCB Resolution No. 2009-0011, which established the statewide Recycled Water Policy, SNMPs for each groundwater basin in California are required by 2014, as stated previously. The SNMPs are called for to facilitate basin-wide or watershed-wide management of salts and nutrients in a manner that optimizes recycled water use while ensuring attainment of water quality objectives and protection of beneficial uses.

Seaside Basin

The SNMP for the Seaside Basin was completed and submitted to the RWQCB in 2014 to comply with the Recycled Water Policy. It has not yet been adopted into the Basin Plan. As documented in the SNMP, ambient groundwater generally exceeds the Basin Plan groundwater objective for total dissolved solids in many areas of the Seaside Basin, while nitrate and chloride concentrations generally meet Basin Plan objectives. Studies conducted to evaluate the water quality of the stabilized RO pilot plant recycled water for the Proposed Project found that the concentrations of total dissolved solids, nitrate, and chloride in the recycled water met all Basin Plan objectives. Further, these concentrations were generally lower than average concentrations in groundwater. As such, replenishment of the Seaside Basin using the Proposed Project purified recycled water would not degrade, but would provide benefits to, local groundwater quality.[25]

Salinas Valley Groundwater Basin

For the Salinas Valley Groundwater Basin, which is part of the Greater Monterey County IRWM region, the Central Coast RWQCB is currently conducting a study that is assessing salt and nutrient surface and groundwater levels, sources, and pathways in the lower Salinas River and Reclamation Ditch watersheds under a grant from the EPA. This work will include development of a simplified salt and nutrient groundwater/surface water model of the lower Salinas River watershed and groundwater basins. The study is intended to support development of salt-related Total Maximum Daily Loads (TMDLs) and regional SNMPs. The Proposed Project will be considered in this study as a potential future condition that would interact with the Salinas Valley Groundwater Basin. The study may provide additional data and information to support future management decisions related to use of recycled water.

Salinas Valley Groundwater Management Plan

As discussed above, several Proposed Project components are located on land overlying the Salinas Valley Groundwater Basin. The Crop Irrigation component of the Proposed Project would increase water supplies for use in the Castroville Seawater Intrusion project area, resulting in reductions in pumping by the supplemental wells in that area. In 1992, the California State Legislature adopted the Groundwater Management Act (California Water Code Part 2.7, §10753), originally enacted as AB 3030 and amended by SB 1938 in 2002. The Groundwater Management Act provided the authority to prepare groundwater management plans and encouraged local agencies to work cooperatively to manage groundwater resources within their jurisdictions and groundwater basins.

The MCWRA prepared a Groundwater Management Plan (GWMP) for the Salinas Valley Groundwater Basin. The purpose of the GWMP is to provide a comprehensive overview of the Salinas Valley Groundwater Basin and to recommend various management strategies for the basin. Specifically, this document provides the framework for the management of groundwater resources in the Salinas Valley Groundwater Basin (exclusive of the Seaside and Paso Robles subareas) and acts as a guidance document for future groundwater projects. This Proposed Project would implement several policies in that plan, including Plan

[25] See http://seasidebasinwatermaster.org/Other/Seaside_Salt_Nutr_Plan_FINAL.PDF for more information.

Element 6: Short-Term and Long-Term Water Quality Management, and Plan Element 7: Continued Integration of Recycled Water.

Seaside Basin Adjudication and Management Plans

This section provides an overview of the Seaside Basin adjudication, Monitoring and Management & Implementation Plans, Basin Management Action Plan, and Seawater Intrusion Response Plan.

Historical and persistent low groundwater elevations caused by pumping led to concerns that seawater intrusion may threaten the Seaside Basin's groundwater resources. In 2006, an adjudication (*Cal-Am v. City of Seaside et al*.) led to the issuance of a Monterey County Superior Court decision that created the Seaside Basin Watermaster (Watermaster). The court concluded that groundwater production within the Seaside Basin exceeded the "Natural Safe Yield"[26] and therefore a physical solution was established to prevent seawater intrusion and its deleterious effects on the Basin. The Watermaster consists of nine representatives, one representative from each of the following: CalAm, City of Seaside, Sand City, City of Monterey, City of Del Rey Oaks, MPWMD, MCWRA, and two representatives from landowner groups. In 2012, the Watermaster evaluated water levels in the basin and determined that while seawater intrusion did not appear to be occurring, water levels were lower than those required to protect against seawater intrusion. Water levels were found to be below sea level in both the Paso Robles (the shallower aquifer) and the Santa Margarita Aquifers of the Seaside Basin. The threat of seawater intrusion is being reduced through triennial pumping reductions, which end in 2021 at the Natural Safe Yield of 3,000 AFY.

The Watermaster Technical Advisory Committee (TAC) has modeled several levels of groundwater recharge to the basin and concluded that supplemental water supply (injection well replenishment) is necessary to recover water levels to prevent seawater intrusion. There is a desire to achieve these levels within 20 to 25 years. Estimates of how much injection is required vary, but 750 to 1,000 AFY have been discussed. The Watermaster Board is considering how such a project would be financed and is encouraging local entities such as CalAm, MPWMD, and MRWPCA to consider planning for such a water supply project.

In addition to the creation of a Watermaster, the court mandated a Monitoring and Management Plan (M&MP) be developed; the M&MP was completed in September 2006. The purpose of the Seaside Basin M&MP and its associated Implementation Plan (2007) was to establish a logical, efficient and cost-effective work plan to meet the requirements of the Seaside Basin Adjudication. The Implementation Plan contains a description of the phases identified for the Implementation Plan work effort, a detailed scope, budget and schedule of tasks planned, as well as a summary of other projects underway that, in addition to implementation of the M&MP, will develop solutions to the threat of seawater intrusion and establish a maximum perennial yield for the producers who rely on the Seaside Basin for their water supply.

In 2008 and 2009, the Watermaster through their consultant, HydroMetrics WRI, prepared the Seawater Intrusion Response Plan and the Basin Management Action Plan. The Seawater Intrusion Response Plan is the Watermaster's contingency plan for responding to

[26] "Natural Safe Yield" was defined as "the quantity of Groundwater existing in the Seaside Basin that occurs solely as a result of Natural Replenishment" (California American Water v. City of Seaside, et al., Case No. 66343 (Monterey County Superior Court, 2006).

seawater intrusion in the Seaside Basin, if and when it occurs. The Seawater Intrusion Response Plan details both the indicators of seawater intrusion, and a list of recommended actions to be taken if seawater intrusion is observed. The Basin Management Action Plan describes the existing condition, identifies supplemental water supplies, groundwater management actions, and other recommendations, including the recommendation for development and use of a hydrogeologic model to evaluate proposed projects that may harm or benefit the basin. Since then a hydrogeologic model has been developed, and this model has been used to assess the impacts of the Proposed Project on the Seaside Basin. See discussions about the model in **Section 4.10.4.2**, under the section titled “Groundwater Depletion, Levels and Recharge: Seaside Basin.”

Plans and Policies Consistency Analysis

Table 4.10-11, Applicable Local Plans, Policies, and Regulations – Hydrology and Water Quality: Groundwater describes the state, regional, and local land use plans, policies, and regulations pertaining to groundwater hydrology and water quality that are relevant to the Proposed Project and that were adopted for the purpose of avoiding or mitigating an environmental effect. Also included in **Table 4.10-11** is an analysis of project consistency with these plans, policies, and regulations. In some cases, policies contain requirements that are included within enforceable regulations of the relevant jurisdiction. Where the analysis concludes the project would not conflict with the applicable plan, policy, or regulations, the finding and rationale are provided. Where the analysis concludes the project may conflict with the applicable plan, policy, or regulation, the reader is referred to **Section 4.10.4, Environmental Impacts and Mitigation Measures**, for additional discussion, including the relevant impact determination and mitigation measures.

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Table 4.10-11
Applicable Local Plans, Policies, and Regulations – Hydrology and Water Quality: Groundwater

Project Planning Region	Applicable Plan	Resource Topic	Project Component(s)	Specific Policy or Program	Project Consistency with Policies and Programs
County of Monterey	Monterey County General Plan	Public Services	Salinas Treatment Facility Storage and Recovery Reclamation Ditch, Tembladero Slough, and Blanco Drain Diversions Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy PS-2.8:** The County shall require that all projects be designed to maintain or increase the site's pre-development absorption of rainfall (minimize runoff), and to recharge groundwater where appropriate. Implementation shall include standards that could regulate impervious surfaces, vary by project type, land use, soils and area characteristics, and provide for water impoundments (retention/detention structures), protecting and planting vegetation, use of permeable paving materials, bioswales, water gardens, and cisterns, and other measures to increase runoff retention, protect water quality, and enhance groundwater recharge.	**Consistent:** The proposed new pipelines would be buried below the ground surface, mainly within existing developed or disturbed areas, and would therefore result in no effect on the absorption of rainfall. The Treatment Facilities at the Regional Treatment Plant would be constructed in unpaved areas and all rainwater would be routed to the permeable surrounding sandy soils. The Salinas Treatment Facility Storage and Recovery component would change operations at the existing facility that affect recharge to groundwater, but as described under Impact GW-3, where it describes how the Proposed Project would result in an overall benefit to groundwater supplies in the Salinas Valley Groundwater Basin.
County of Monterey	Monterey County General Plan	Public Services	Salinas Treatment Facility Storage and Recovery Reclamation Ditch, Tembladero Slough, and Blanco Drain Diversions Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy PS-2.9:** The County shall use discretionary permits to manage construction of impervious surfaces in important groundwater recharge areas in order to protect and manage groundwater as a valuable and limited shared resource. Potential recharge area protection measures at sites in important groundwater recharge areas may include, but are not limited to, the following: a. Restrict coverage by impervious materials. b. Limit building or parking footprints. c. Require construction of detention/retention facilities on large-scale development project sites overlying important groundwater recharge areas as identified by Monterey County Water Resources Agency. The County recognizes that detention/retention facilities on small sites may not be practical, or feasible, and may be difficult to maintain and manage.	**Consistent:** The Proposed Project includes only small areas of increased impervious surfaces. New impervious areas will occur at the Treatment Facilities at the Regional Treatment Plant, at each of the Booster Pump Stations and at each well cluster at Injection Well Facilities; however, at those sites all runoff will be directed to on-site or nearby unpaved areas and allowed to percolate.
County of Monterey (coastal zone & inland areas)	Monterey County Code	Water Wells	Injection Well Facilities	**Section 15.08.030:** Permit—Required. No person shall construct, repair, reconstruct or destroy any well, abandoned well, cathodic protection well, observation well, monitoring well, or test well unless a written permit has first been obtained from the Health Officer of the County or his or her authorized representative as provided in this Chapter.	**Consistent:** As described in Chapter 3, Project Description, MRWPCA proposes and would be required to obtain a Well Construction Permit from the Monterey County Department of Environmental Health prior to commencement of project well construction.
County of Monterey (coastal zone & inland areas)	Monterey County Code	Water Wells	Injection Well Facilities	**Section 15.08.110:** Technical Standards. a. Standards. Standards for the construction, repair, reconstruction of or destruction of wells shall be as set forth in Chapter II and Appendices A, B, C D of the Department of Water Resources Bulletin No. 74-81, "Water Well Standards" (December, 1981).	**Consistent:** As a part of the proposed project, the construction of the wells will be incompliance with DWR Bulletin 74-81.
County of Monterey (coastal zone & inland areas)	Monterey County General Plan	Safety	Injection Well Facilities	**Policy S-3.2:** Best Management Practices to protect groundwater and surface water quality shall be incorporated into all development.	**Consistent:** The proposed project would be subject to the state Construction General Permit, and the RWQCB Resolution R3-2013-0032c, which require construction-related best management practices to prevent concentrated storm water runoff, soil erosion, and release of construction site contaminants. Surface water quality is discussed in Section 4.11 Hydrology and Water Quality: Surface Water.
City of Marina	City of Marina General Plan	Community Infrastructure	RUWAP Alignment Option Coastal Alignment Option RUWAP Booster Pump Station Option	**Policy 3.3:** The intent of the General Plan Transportation and Infrastructure Element is to ensure that the requirements for transportation, water supply, wastewater collection and treatment, storm water drainage, and solid-waste disposal generated by existing and future development are adequately provided for. It is also the intent of this section to ensure, to the maximum extent possible, that the provision of such services does not have a deleterious effect on either natural resources or the quality of life of residents of Marina or other potentially affected areas. The major concerns of this section are outlined below: ….(11) Minimize the consumption of water for urban purposes and make maximum possible use of recycled water. ….(14) Support water resource programs, including desalinization and reclamation efforts, to provide an adequate water supply to accommodate General Plan permitted growth.	**Consistent:** The purpose of the Proposed Project is to provide a replacement water supply source for existing municipal water sources to allow reductions in diversions from the Carmel River and to provide crop irrigation water, which will reduce groundwater pumping from the Salinas Valley Groundwater Basin. These purposes are consistent with City's support of water resource programs, including reclamation efforts.
City of Seaside	City of Seaside General Plan	Land Use	RUWAP and Coastal Alignment Options Coastal Booster Pump Station Option Injection Well Facilities Transfer Pipeline Monterey Pipeline	**Goal LU-5:** Collaborate with local and regional water suppliers to continue to provide quality water supply and treatment capacity to meet community needs.	**Consistent:** The Proposed Project would provide alternative water supply through advanced treatment and groundwater injection, and crop irrigation water through tertiary treatment.
Former Fort Ord (City of Seaside)	Fort Ord Reuse Plan	Conservation	Injection Well Facilities	**Hydrology and Water Quality Policy A-1:** At the project approval stage, the City shall require new development to demonstrate that all measures will be taken to ensure that runoff is minimized and infiltration maximized in groundwater recharge areas	**Consistent:** The above-ground components of the proposed Injection Well Facilities would be constructed in unpaved areas. All rainwater would be routed to the surrounding unpaved sandy areas and allowed to infiltrate into the subsurface as recharge. The below-ground components would not affect groundwater recharge.

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4.10.4 Impacts and Mitigation Measures

4.10.4.1 Significance Criteria

In accordance with Appendix G of the CEQA Guidelines, a project would have a significant impact on hydrology and water quality of groundwater if it would:

a. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)

b. Violate any water quality standards or otherwise degrade water quality

4.10.4.2 Impacts Analysis Overview

Approach to Analysis: Construction Impacts

Groundwater Depletion, Levels, and Recharge

During construction, the Proposed Project would use water for soil compaction and dust control. The amount of water use is quantified and the sources of construction water are provided to determine if this use would adversely affect groundwater levels. At some component sites, there would be new impervious surfaces constructed that may potentially change local recharge characteristics at each site. Along pipeline routes, groundwater recharge characteristics would not change because the existing site surfaces would be restored to pre-construction conditions and there would be no increases in the quantity of impervious surfaces and no loss of recharge ability. Where components are located on existing paved areas, no change in impervious surface area and no change in recharge would result. Where components would be located on existing unpaved areas and would include new impervious surfaces (i.e., Treatment Facilities at the Regional Treatment Plant, Coastal Booster Pump Station, and the Injection Well Facilities), the analysis of changes to groundwater recharge is presented in more detail, below. In particular, the impact analysis includes quantification of the increase in impervious surfaces and a description of the method proposed for insuring that rainfall runoff from new impervious areas is allowed to flow to adjacent pervious areas to recharge the groundwater basins underlying the component sites.

Groundwater Quality

The impacts analysis presents information on potential sources of groundwater contaminants during construction and assesses whether those contaminants may be released to the environment resulting in significant groundwater quality impacts due to construction of the Proposed Project.

Approach to Analysis: Operational Impacts

Groundwater Depletion, Levels, and Recharge: Salinas Valley Groundwater Basin

This section describes the approach for analyzing whether the Proposed Project may result in a significant impact related to depleting groundwater supplies or interfering substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.

The Proposed Project operations would significantly impact groundwater resources if operations were to result in groundwater mounding, changes in groundwater gradients, or lowering of groundwater levels such that nearby municipal or private groundwater production wells experience a substantial reduction in well yield or physical damage due to exposure of well screens. Substantial reduction would occur if wells were to become incapable of supporting existing land uses or planned uses for which permits have been granted. More specifically, one of the following two conditions may occur that would trigger this condition:

- a decline in average groundwater level is significant if it would lower the water level to a depth below the median depth to the top of the well screen in nearby wells. When the top of the screen is above the water table it tends to corrode, which increases the risk of casing collapse. Also, air is entrained in the water pumped from the well, which promotes cavitation at the well pump and damage to the pump bowls. Over time, these physical effects will shorten the life of the well and could cause sudden well failure which, in turn, could affect well productivity (Todd Groundwater, February 2015).
- a decline in average groundwater level is significant if it would decrease pump output (in gallons per minute) by more than 10%. Decreases smaller than this amount can usually be accommodated by increasing the duration of pumping for each irrigation cycle (Todd Groundwater, February 2015).

For the Salinas Valley Groundwater Basin, the following geographic areas of impact are assessed: (1) impacts on local groundwater levels and wells near portions of the Reclamation Ditch system and the Salinas River that could be affected by source water diversion from surface water bodies, (2) impacts on local groundwater levels and wells near the Salinas Treatment Facility (that contains existing wastewater treatment and disposal facilities, specifically percolation ponds, beds, and basins) proposed for operational changes due to the diversions of agricultural wash water and storm water and the Salinas Treatment Facility Storage and Recovery components, and (3) the regional effects of the Proposed Project as a whole on the Salinas Valley Groundwater Basin.

Surface Water Diversions Recharge Assessment

The analysis of recharge impacts associated with surface water diversions on Salinas Valley Groundwater Basin recharge is focused on localized impacts on groundwater levels and wells in the vicinity and downstream of the locations proposed for surface water diversions from the Reclamation Ditch, Tembladero Slough and Blanco Drain. The overall water balance of inflows and outflows to and from the Salinas Valley Groundwater Basin and the overall groundwater storage volumes and water levels in the 180/400 Foot Aquifer Subbasin would benefit from the Proposed Project due to the provision of up to 5,142 AFY of new tertiary-treated recycled water for irrigation of the CSIP area in lieu of groundwater pumping from these aquifers. The impacts analysis on local wells and groundwater levels thus focuses on the changes in recharge amounts from assessments of hydrologic changes in the surface water bodies, groundwater cross-sections, previous studies, including consideration of the location and function of nearby wells (Schaaf & Wheeler, 2015c).

Salinas Pump Station and Treatment Facility Storage and Recovery Recharge Assessment

Potential changes in recharge and the associated effects on water levels of the Salinas Valley Groundwater Basin in the vicinity of the Salinas Treatment Facility (i.e., within a 1.5-mile radius of the center of the site) are assessed in a Todd Groundwater report which is provided in **Appendix N**. This section summarizes the approach used by Todd Groundwater in this analysis. As described above, the Proposed Project would provide tertiary treated recycled water for crop irrigation, which would reduce groundwater pumping in the Salinas Valley Groundwater Basin. The volume of decreased pumping within the CSIP area would be more than an order of magnitude higher than the loss of recharge from the Salinas Treatment Facility, thus overall the Proposed Project would have a beneficial impact on the Salinas Valley Groundwater Basin.

For the local Impacts on groundwater levels and wells near the Salinas Treatment Facility, Todd Groundwater first assessed the existing operations and developed two baseline scenarios as described in **Section 4.10.2**. Some of the water that percolates from the Salinas Treatment Facility flows downward through gaps in the Salinas Valley Aquitard and becomes recharge to the 180-Foot Aquifer and other connected aquifers in the Salinas Valley Groundwater Basin. A decrease in percolation would decrease recharge and tend to lower groundwater levels in wells near the Salinas Treatment Facility that pump from the 180-Foot Aquifer. If the decline in water levels were large, it could impact groundwater availability to well owners by physically damaging wells or by decreasing their pumping rates.

Todd Groundwater based their assessment of the Proposed Project on estimates of the monthly use of source waters under several operating scenarios (See the **Section 2.7.1** of **Chapter 2, Project Description** for a description of the source water availability and assumed diversion scenarios). In addition, the amount of water proposed to be sent to, or recovered from, the Salinas Treatment Facility for each month of the year was used, including monthly inflows and outflows in normal/wet years and in drought years.

Todd Groundwater calculated the amount of percolation by month and year type for each potential scenario of operation of the Proposed Project. The analysis made certain assumptions about the distribution of percolation among the various ponds, basins and drying beds at the Salinas Treatment Facility that are described in **Section 4.10.2.1**, above. This analysis compares conditions under the Proposed Project with the two baseline conditions (2013 existing conditions and 2017 conditions at commencement of Proposed Project operations) for pond percolation to determine if there would be a substantial change in groundwater levels and recharge that would result in a significant impact. Once the quantity of loss of percolation to the groundwater system was calculated, Todd Groundwater estimated changes to water levels in the vicinity of the Salinas Treatment Facility to determine quantitatively whether any local wells would be adversely impacted.

Approach to Analysis for Groundwater Depletion, Levels, and Recharge in the Seaside Basin

The Proposed Project's impact assessment related to groundwater depletion, levels, and recharge in the Seaside Basin is provided in **Appendix L, Draft Recharge Impacts Assessment Report** (Todd Groundwater, 2015). To predict the transport of the Proposed Project's purified recycled water in the groundwater system and to evaluate potential impacts of the Proposed Project on groundwater levels and quantity, HydroMetrics conducted groundwater modeling using the Seaside Basin groundwater flow model. The modeling of the Proposed Project builds on previous modeling runs that were used during project development to allocate purified recycled water between the two basin aquifers (HydroMetrics WRI, 2013). The initial project development modeling was described in the Draft Recharge Impacts Assessment report (see Section 3.3.5.1 in **Appendix L**). The technical memorandum documenting the project development and impacts analysis modeling results are included as Appendices B and C, respectively, **in Appendix L**.

The Proposed Project modeling incorporated the estimates by the MRWPCA staff of the monthly schedule and quantities of delivery of Proposed Project purified recycled water for subsurface injection in various year types as described in **Chapter 2, Project Description** and Section 2 of **Appendix L**. The appropriate purified recycled water delivery schedule shown on **Table 2-8, CalAm Water Production for Water Years 2006 – 2014 (in Acre-Feet)** in **Chapter 2, Project Description** was assigned to each year of project operation in the modeling based on hydrology and the balance of the drought reserve account.

The Proposed Project modeling was conducted using the predictive model setup that the Seaside Basin Watermaster has developed previously for analyzing future conditions in the basin. The predictive model covers a 33-year period from 2009 through 2041. The Proposed Project well operations are currently anticipated to begin in 2017. For purposes of the modeling analysis, the subsurface application was simulated as beginning in October 2016 to cover the entire Water Year 2017 and allow for a 25-year analysis of the Proposed Project.

The Proposed Project modeling was also conducted using reasonable assumptions of future operation of production wells in the basin. Production wells were assumed to be pumping in the model based on court-allocated pumping and agreements associated with the Seaside Basin adjudication. Existing CalAm production wells (and the ASR wells) were assumed to be the recovery (extraction) wells for the Proposed Project purified recycled water based on existing well capacity and water demand.

The Proposed Project modeling also incorporated a quantitative assessment of future operations of the ASR Project. This assessment was developed by MPWMD, which coordinates the ASR injection and extraction operations under cooperative agreements with CalAm. The assessment was based on historical hydrologic conditions on the Carmel River between 1987 and 2008 and approved rules of ASR operation. This allowed MPWMD to predict both injection and recovery schedules at each ASR well over time. By incorporating this assessment into the model setup, the Proposed Project was evaluated during a full range of ASR injection and recovery (pumping) conditions.

Approach to Analysis for Groundwater Quality

Based on the significance criterion (specifically, criterion b), this EIR uses a project-specific approach to determining whether implementation of the Proposed Project would be considered to have a significant impact to groundwater quality. Specifically, this EIR assumes a significant impact to groundwater quality would occur if the Proposed Project, taking into consideration the proposed treatment processes and groundwater attenuation and dilution, were to do one of the following:

- Impact groundwater quality so that it no longer met standards (e.g., Basin Plan beneficial uses and water quality objectives, including drinking water MCLs established to protect public health), or
- Degrade groundwater quality subject to California Water Code statutory requirements (Section 13540), and to the SWRCB Anti-degradation Policy and Recycled Water Policy, and
- Result in changes to groundwater recharge such that it would adversely affect groundwater quality by exacerbating seawater intrusion.

Salinas Valley Groundwater Basin Water Quality Assessment

The only Proposed Project components that overly and that would interact with the Salinas Valley Groundwater Basin during operations would be the source water diversions from surface water bodies (Reclamation Ditch, Tembladero Slough, and Blanco Drain Source Water Diversion components), the Salinas Pump Station Diversion component, the Salinas Treatment Facility Storage and Recovery component, and the Treatment Facilities at the Regional Treatment Plant. No other components are addressed individually in the impact analysis of the Salinas Valley Groundwater Basin; however, the net benefits to groundwater quality in the Salinas Valley Groundwater Basin are discussed qualitatively.

Source Water Diversion from Surface Waters (Reclamation Ditch, Tembladero Slough, and Blanco Drain)

Because the water quality of the surface waters from which Proposed Project source water diversions would occur are contaminated (i.e., listed as impaired water bodies according to the Clean Water Act 303(d) program) as described in **Section 4.11 Hydrology and Water Quality: Surface Water**, diversion and treatment of these waters would be a net benefit to groundwater quality. As discussed above, only minor amounts of local recharge may be reduced to the Salinas Valley Groundwater Basin when viewing the surface water diversions in isolation. No groundwater quality impacts due to operations of the diversions would occur and the diversion components are not addressed further in this section. The project as a whole would have direct and quantifiable benefits to the Salinas Valley Groundwater Basin water quality by providing new water to reduce pumping in the seawater intruded portions of the basin. For a discussion of potential pollutant load reduction benefits of diverting surface waters for recycling, see **Section 4.11.4** of this EIR. For a discussion of the benefits of the Proposed Project see **Section 2.1** of **Chapter 2, Project Description**.

Source Water Diversion related to Salinas Treatment Facility Pond Percolation

The effect of Salinas Treatment Facility percolation on water quality in the Salinas River and 180-Foot Aquifer depends on the concentrations of individual chemical constituents in the Salinas Treatment Facility ponds compared to existing concentrations and water quality objectives for the river and groundwater. The analysis of the Salinas Treatment Facility component of the Proposed Project compares median concentrations of chloride, nitrate, total dissolved solids, and phosphorus in the pond water to the groundwater. These constituents are present in pond water at concentrations that pose a risk of contamination. Data for the Blanco Drain are used as a surrogate for shallow groundwater, because most of the flow in Blanco Drain derives from soil water at the base of the root zone in agricultural fields, which is pumped into Blanco Drain from agricultural drainage tile systems. The data were compiled from various monitoring programs with differing suites of constituents and periods of record. Aquifer-specific data for groundwater quality were not available, and data considered in the impact analysis probably reflect a combination of 180-Foot Aquifer and 400-Foot Aquifer groundwater.

Treatment Facilities at the Regional Treatment Plant

The Treatment Facilities at the Regional Treatment Plant would not result in any impacts to the Salinas Valley Groundwater Basin water quality, except as it relates to the beneficial effects of treating additional flows of source water and providing those flows as tertiary recycled water to supplement existing sources of water for crop irrigation in the CSIP area. Existing regulatory requirements and best management practices at the Regional Treatment Plant site prevent accidental spills and other water pollutants from being discharged to unpaved areas and ultimately reaching groundwater. No groundwater quality impacts due to operations of this component would occur and this component is not addressed further in this section.

Seaside Basin Water Quality Assessment

To evaluate potential impacts on groundwater quality due to the Proposed Project injection of purified recycled water, both the existing groundwater quality and quality of the Proposed Project purified recycled water are characterized. The characterization of existing groundwater quality establishes a baseline for the water quality impacts assessment of the Proposed Projects' groundwater replenishment component. In this EIR, the Seaside Basin is the basin into which the purified recycled water would be applied via subsurface application using the Injection Well Facilities. This water quality characterization for existing Seaside Basin groundwater was prepared by Todd Groundwater (see **Appendix L,** Section 7.3). The characterization incorporates available data and previous investigations, and also summarizes the results of new geochemical evaluations regarding the chemistry of the water and its potential for interactions with the existing geologic sediments in the Proposed Project area. The approach to the geochemical analyses is presented more fully in a separate report on the MRWPCA field program (Todd Groundwater, February 2015). The characterization of existing and proposed purified recycled water provided in **Appendix L** supports the conclusions related to the impacts of the Proposed Project on the Seaside Basin water quality related to Criteria b, above.

The water quality statutory and regulatory requirements that protect groundwater quality and public health and how the Proposed Project would comply with those requirements are summarized in **Chapter 3, Water Quality Statutory and Regulatory Compliance**. A more detailed description and analysis of how the Proposed Project would comply with those requirements is provided in **Appendix D** (Nellor Environmental Associates, 2015). The report reviewed the analytical results of source water monitoring, the water quality results of the Proposed Project pilot plant testing (using ozone, microfiltration, and RO), the stabilized RO sample, information on the predicted performance and water quality of the proposed full-scale AWT Facility based on the pilot testing and treatment performance for other existing groundwater replenishment projects, and related research/studies. It analyzed the Proposed Project's ability to comply with federal and state water quality statutory and regulatory requirements to protect water quality for potable supplies/human health and other beneficial uses of groundwater. Relevant impact analyses and conclusions are presented in this section.

Areas of No Impact

The Proposed Project would have potential impacts related to both of the significance criteria above during construction and operation.

Summary of Impacts

Table 4.10-12 provides a summary of potential impacts to groundwater resources and significance determinations at each Proposed Project component site.

Table 4.10-12
Summary of Impacts –Hydrology and Water Quality: Groundwater

Impact Title	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance		Injection Well Facilities	CalAm Distribution System		Project Overall
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero		RUWAP Alignment Option	Coastal Alignment Option		Transfer Pipeline	Monterey Pipeline	
GW-1: Construction Groundwater Depletion and Levels	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
GW-2: Construction Groundwater Quality	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
GW-3: Operational Groundwater Depletion and Levels: Salinas Valley Groundwater Basin	LS	LS	LS	LS	NI	NI	BI	NI	NI	NI	NI	NI	BI
GW-4: Operational Groundwater Depletion and Levels: Seaside Basin	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	NI	LS
GW-5: Operational Groundwater Quality: Salinas Valley Groundwater Basin	BI	BI	LS	LS	LS	NI	BI	NI	NI	NI	NI	NI	BI
GW-6: Operational Groundwater Quality: Seaside Basin	NI	NI	NI	NI	NI	NI	BI/LS *	NI	NI	BI/ LS*	NI	NI	BI/ LS*
Cumulative Impact	LS: The Proposed Project would not contribute to significant cumulative impacts to groundwater levels, recharge or storage in the Salinas Valley Groundwater Basin. There would be no significant construction or operational cumulative impacts to groundwater levels, recharge, or storage in the Seaside Basin. The Proposed Project would not make a considerable contribution to a significant cumulative impacts to groundwaterquality in the Seaside Basin.												

BI – Beneficial Impact
NI – No Impact
LS – Less than Significant
LSM – Less than Significant with Mitigation
SU – Significant Unavoidable
** For concentrations of total dissolved solids and chloride, the impact would be beneficial; for all other water quality parameters, the impact would be less than significant.*

4.10.4.3 Construction Impacts and Mitigation Measures

Impact GW-1: <u>Construction Groundwater Depletion, Levels, and Recharge</u>. Construction of the Proposed Project components would not deplete groundwater supplies nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of local groundwater levels. (Criterion a) (Less than Significant)

Construction at all Proposed Project sites would result in a limited, temporary demand for water for construction-related purposes, typically associated with watering surfaces for compaction and dust control. Construction water is typically acquired by the construction contractor. Contractors prefer local sources of water to fill their water trucks; therefore, the Proposed Project is expected to use water from one of the following sources for most construction:

- Salinas Valley Reclamation Plant or other reclamation plant (such as plants in the Carmel or Watsonville areas) when it is in excess of the amount of water needed for irrigation demands.
- Groundwater from beneath the Regional Treatment Plant site that is also currently used for dust control at the adjacent landfill and for non-potable uses at the Regional Treatment Plant.

For Injection Well Facilities construction, groundwater from nearby water supply wells would be used; however, the water would be allowed to percolate onsite after its use for construction purposes and, therefore, a majority of it would be returned to the groundwater basin. Portable toilets would be installed at construction sites for construction workers, which would not require use of groundwater.

The amount of construction water used at any individual construction site is estimated to be a onetime use of approximately 70 AF total, or about 1.1 AF per acre of ground disturbance. Some of the water applied at the construction sites would percolate to the Salinas Valley Groundwater Basin A-aquifer or the Seaside Basin depending upon which basin is beneath each Proposed Project component site. In comparison to total groundwater pumping in these basins (an average of approximately 5,000 AFY in the Seaside Basin and over 200,000 AFY total in the 180/400-foot Aquifer Subbasin and Eastside Subbasins of the Salinas Valley Groundwater Basin), this small amount of construction water use would not have a significant adverse impact on groundwater recharge, volume or levels.

Source Water Storage and Diversion Sites

New diversion structures, pipelines, and pump stations would be constructed in primarily unpaved areas for the various source water diversion and storage sites; however, only approximately 200 square feet of new impervious surfaces for pump station and diversion structure pads would be added at most diversion sites (not including pipelines). In all cases, the surrounding areas would remain unpaved and rainwater falling on the facilities would be allowed to infiltrate into the ground. This amount of new impervious surface would not substantially interfere with groundwater recharge and would result in a less-than-significant impact.

Treatment Facilities at the Regional Treatment Plant

The proposed Treatment Facilities at the Regional Treatment Plant (including the AWT Facility and the Salinas Valley Reclamation Plant modifications) would include structures that would result in the construction of about 3.5 acres of new impervious surfaces that would restrict rainfall from infiltrating into the subsurface, potentially interfering with groundwater recharge. However, rainwater falling on these structures would be routed to the unpaved surrounding area that will remain unpaved. Design plans include on-site retention of storm water (see **Figure 2-27, Advanced Water Treatment Facility Conceptual Site Plan**); rainwater would still be able to infiltrate into the subsurface and recharge the underlying aquifer. Therefore, the additional impervious surfaces to be added during construction of the Treatment Facilities at the Regional Treatment Plant would have a less-than-significant impact relative to groundwater recharge or levels.

Product Water Conveyance System Pipelines and Pump Station

The Product Water Conveyance pipelines would be constructed mostly within existing paved rights of-way and would disturb a relatively narrow width of land (10 to 15 feet) in unpaved areas. The areas of ground surface disturbance would be restored to pre-construction conditions. Therefore, none of the pipelines would substantially reduce recharge. The construction of the pipelines would include a very small amount of groundwater pumping (if any) and would have no effect on groundwater levels. Therefore, the construction of the pipelines would have no impact relative to groundwater recharge, volume, or levels.

The 2,000-square-foot Booster Pump Station would be built on one of two optional sites (depending on the pipe alignment selected), the RUWAP and the Coastal. For the RUWAP site, the new facilities would be located on an existing paved site, resulting in no new or additional impervious surfaces. For the Coastal site, the new pump station would be constructed in an unpaved area. The surrounding area would remain unpaved, providing a route for rainwater falling on the pump station to infiltrate back into the ground and recharge the underlying aquifer. Design plans include on-site retention of storm water (see **Figure 2-31, Proposed Booster Pump Station Options Conceptual Site Plan**); therefore, rainwater would still be able to infiltrate into the subsurface and recharge the underlying aquifer. In both cases, the Booster Pump Station construction would not use substantial amounts of groundwater and would not interfere substantially with recharge, thus resulting in a less-than-significant impact on groundwater.

Injection Well Facilities

Installation of any of the wells (deep injection, vadose zone and monitoring wells) typically would follow a three-step process: drilling and logging, installation/development, and testing and equipping. Construction of Injection Well Facilities would use a rotary drilling method that would be customized to minimize borehole impacts from drilling fluids. The method may incorporate air rotary methods or specialized drilling fluids (such as polymers). Water is sometimes added during the drilling of wells to reduce friction on the drill casing and assist in returning drill cuttings to the surface. If this water comes from groundwater supplies (i.e., wells in the Seaside Basin), aquifer volumes or groundwater levels would not be affected because that water would be returned to the basin (except for minor amounts of evaporation). In addition, each well cluster would include electrical and motor control systems that would be housed in an approximately 400 square-foot building. The addition of the four buildings and surrounding parking and concrete/asphalt area would result in the addition of impervious surfaces; however, the new impervious surfaces would not reduce groundwater recharge because all runoff from these areas would be percolated in adjacent open space areas comprised of sandy soils.

As noted above, the drilling process may require the use of some water. The water would be Seaside Basin water from nearby existing water supply wells. Use of the groundwater during construction would be minimal, and most of it would be returned to the basin via percolation on site, such that it would not substantially affect groundwater levels and storage, resulting in a less-than-significant impact to aquifer volumes and groundwater levels.

The wells would be developed to remove introduced drilling fluids and native fine-grained material suspended in water in the well casing. Well development is a standard procedure that is always performed in order to maximize the well efficiency by removing fine-grained material that would clog the slots in the well screen and pore spaces of the filter pack and the surrounding aquifer formation, both of which would reduce the flow of water into the well. The procedure is conducted in general accordance with the American Society for Testing and Materials (ASTM) D5521-02: Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers and includes two steps. After residual filter pack material is removed from the well by bailing, the wells would be developed first by mechanical means, which could including swabbing and bailing or swabbing and airlifting. Both methods are used to clean the screen section and consolidate the filter pack around the well screen. Once the screen has been satisfactorily cleaned, and turbidity is reduced, a submersible pump would aggressively pump and surge the well until the fluids removed are free of sand and sediment, and have very low turbidity values.

The volume of water pumped for development of each well would be about 3,600,000 gallons, based on four 10-hour days of development pumping at 1,500 gpm as estimated by Todd Groundwater. If the water used for development were drawn from groundwater and not returned as recharge, aquifer volumes or groundwater levels could be decreased; however, well development water at the Injection Well Facilities would be allowed to percolate back to the groundwater basin through on-site disposal resulting in a less-than-significant impact to aquifer volumes and groundwater levels.

The new well clusters at the Injection Well Facilities site are proposed to be located on existing unpaved areas that would be paved under the Proposed Project. In addition, a paved driveway would be constructed to provide vehicular access to each site. The surrounding area would remain unpaved providing a route for rainwater falling on the pump station to infiltrate back into the ground and recharge the underlying aquifer. Design plans include on-site retention of storm water (see **Figure 2-35, Conceptual Site Plan and Schematic of Typical Well Cluster**); therefore, rainwater would still be able to infiltrate into the subsurface and recharge the underlying aquifer. The Injection Well Facilities construction would not use substantial amounts of groundwater that would not be returned to the groundwater system and would not impact groundwater volume or levels due to loss of recharge.

CalAm Distribution System Pipelines

The CalAm Distribution System pipelines would be constructed mostly within existing paved rights-of way and would disturb a relatively narrow width of land (10 to 15 feet). Therefore the pipelines could not significantly reduce groundwater recharge. Construction of the pipelines would not include pumping substantial amounts groundwater or otherwise interfere with groundwater recharge and therefore would have a less-than-significant impact on groundwater recharge, volume, and levels.

Impact Conclusion

Impacts associated with groundwater depletion, levels and recharge during the construction of the Proposed Project would be less than significant. During construction, the Proposed Project would use water for soil compaction and dust control. The amount water use would be small in relation to overall water resources. At some component sites, there would be new impervious surfaces constructed that may potentially change local recharge characteristics at each site. Along pipelines routes, groundwater recharge characteristics would not change because the existing site surfaces would be restored to pre-construction conditions and there would be no increases in the quantity of impervious surfaces and no loss of recharge ability. Where components are located on existing paved areas, no change in impervious surface area and no change in recharge would result. For sites proposing new impervious surfaces, all rainfall runoff would be retained on site and allowed to percolate to the groundwater basin underlying the site. Therefore, for the project as a whole, the potential construction impacts would be less than significant relative to groundwater recharge, volume, or levels, and no mitigation measures would be required.

Impact GW-2: <u>Construction Groundwater Quality.</u> Proposed Project construction would not violate any water quality standards or otherwise degrade water quality. (Criterion b) (Less than Significant)

Injection Well Facilities

For the construction of the Injection Well Facilities (including deep injection wells, vadose zone wells and monitoring wells), water-based muds would be used; however, relatively small amounts of inert additives would be needed to ensure that the borehole stays open during the drilling and well construction. The addition of these additives could degrade water quality if not handled in accordance with regulatory requirements and professional standards.

Additives used during the construction of the existing ASR Project's injection/extraction wells included EZ Mud® or Mud-Nox®. EZ Mud® is a liquid polymer emulsion containing partially hydrolyzed polyacrylamide/polyacrylate copolymer, used primarily as a borehole stabilizer to prevent reactive shale and clay from swelling and sloughing. EZ-Mud® is added to low-solids drilling fluids (in this case, water) to increase fluid viscosity and keep the borehole open during drilling. Mud Nox® is a concentrated detergent added to drilling mud to reduce solids build-up, decrease friction, aid in reducing solids suspension, and remove "mud-cake" silt and clay from water wells. Mud-Nox® consists of a liquid blend of wetting agents, dispersants, and emulsifiers that are non-corrosive, non-contaminating, and slowly biodegradable. Well drilling and construction could degrade groundwater quality by introducing drilling additives that could alter the water chemistry of the Paso Robles and Santa Margarita Aquifers that are currently used for drinking water supply. With the implementation of previously-described standard well development procedures and compliance with the regulatory requirements (described further below) for the discharge of well development water, the fluids introduced into the aquifer would be removed and the water quality of the Santa Margarita and Paso Robles Aquifers would be restored to its existing condition. Therefore, drilling activities at the Injection Well Facilities would not result in a significant impact on groundwater quality.

The muds and clay slurry generated during the drilling and development of the proposed injection and monitoring wells would fall under the category of "Water Supply Well Drilling Muds" under the General Waiver of Waste Discharge Requirements for Specific Types of Discharges (General Waiver) (RWQCB Resolution R3-2008-0010), discussed in **Section 4.11.3, Regulatory Framework**. Water extracted during drilling and development of the wells would be conveyed to nearby natural depressions and percolated into the ground. The water produced during well development may also be considered a "water supply discharge" under the General Waiver. The contractor would not be required to submit a waste discharge report. However, the following conditions of the General Waiver would apply and implementation would be monitored and enforced by the RWQCB:

- The discharge shall be spread over an undisturbed, vegetated area capable of absorbing the water and filtering solids in the discharge, and spread in a manner that prevents a direct discharge to surface waters;
- The pH of the discharge shall be between 6.5 and 8.3;
- The discharge shall not contain oil or grease;
- The discharge area shall not be within 100 feet of a stream, water body, wetland, or streamside riparian corridor;
- The discharger shall implement appropriate management practices to dissipate energy and prevent erosion;
- The discharger shall implement appropriate management practices to preclude discharge to surface waters and surface water drainage courses; and
- The discharger shall immediately notify the Central Coast RWQCB staff of any discharge to surface waters or surface water drainages. The discharge shall not have chlorine or bromine concentrations that could impact groundwater quality.

With the implementation of standard well development procedures and compliance with these regulatory requirements that are enforced by the RWQCB, the water quality of the aquifers would not be adversely impacted by well drilling and development. Therefore, the impact would be less than significant and no mitigation measures would be required.

All Other Project Components

The Source Water Diversion and Storage components, Treatment Facilities at the Regional Treatment Plant, and Coastal Booster Pump Station option would be constructed on currently unpaved sites. The pipelines and the RUWAP Booster Pump Station would be constructed mostly within existing rights-of way (pipelines) or paved site (RUWAP Booster Pump Station option). Some water may be used for soil compaction and dust control but not in sufficient quantities to flow or infiltrate into the subsurface in significant quantities or to carry pollutants to the groundwater. In addition, storm water pollution prevention plans and best management practices are required by permits administered by the RWQCB. Local agencies require any accidental spills of contaminants or hazardous materials be promptly cleaned to prevent contamination of surface and groundwater. Therefore, the construction of the treatment facilities, pipelines and pump stations would result in a less-than-significant impact related to changes to groundwater quality and no mitigation measures would be required.

Impact Conclusion

Although discharges of pollutants to groundwater during well drilling activities has the potential to occur, impacts to groundwater quality during the construction of the Injection Well Facilities would be less than significant based on the Proposed Project's compliance with regulatory requirements that require best management practices, including preventative and emergency measures for potential spills. For all other components, there would be a less-than-significant impact based on the compliance with regulatory requirements that insure that there would be a lack of substantial pollutants released or disposed at the sites, and the low amount of flow that would carry any pollutants such that no contamination of groundwater resources are expected. Therefore, for the project as a whole, the potential construction impacts would be less than significant relative to groundwater quality and no mitigation measures would be required.

4.10.4.4 Operational Impacts and Mitigation Measures

Impact GW-3: Operational Groundwater Depletion and Levels: Salinas Valley Groundwater Basin. Operation of the Proposed Project would not deplete groundwater supplies in the Salinas Valley nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater levels in the Salinas Valley Groundwater Basin. (Criterion a) (Less than Significant)

Source Water Diversion and Storage Sites

Reclamation Ditch, Tembladero Slough and Blanco Drain Diversions

The Proposed Project implementation would improve overall groundwater conditions of the Salinas Valley Groundwater Basin by reducing extractions of groundwater in the CSIP area. In addition to the well pumping reduction benefits, treating and delivering a portion of surface stream diversions as recycled water to growers in the CSIP area would add to the surface application of water over a large area of the study area (i.e., the Crop Irrigation component of the Proposed Project). Thus, any reduction in recharge due to source water diversions from surface water bodies (Reclamation Ditch, Tembladero Slough and Blanco Drain) to the aquifers underlying the water bodies would only slightly reduce the Proposed Project's beneficial groundwater impacts on the Salinas Valley Groundwater Basin as a whole.

According to hydrologic analysis by Schaaf & Wheeler for this EIR, source water diversion for the Proposed Project would only result in about a two-inch reduction in water level in the Reclamation Ditch system between Highway 183 on the west and the Davis Road bridge on the east for four to five months (intermittently from approximately June through October) each year. The bottom of the channel would remain wet year round and would remain within the current water level variations of the system. In addition, the Proposed Project operations would not result in changes to water levels in Tembladero Slough, Old Salinas River, and the Salinas River Lagoon because water levels in these reaches of the system are predominantly controlled by the tidal cycles in the ocean. The Blanco Drain diversion point is immediately above the confluence with the Salinas River, so the Blanco Drain channel would remain wet. The Salinas River below the Blanco Drain is controlled by the Salinas River Lagoon during most of the year. Because the channels discussed above would remain wet under the Proposed Project, any existing minor groundwater recharge from these channels would continue uninterrupted (Schaaf & Wheeler, 2015b).

Based on the above information, the Proposed Project diversions of surface waters from the Reclamation Ditch, Tembladero Slough, and Blanco Drain would not result in adverse impacts related to groundwater depletion, changes in water levels, and changes in recharge. These source water diversion components would have a less-than-significant impact on groundwater resources in the vicinity of the Proposed Project area and would contribute to the beneficial impacts of the project as a whole.

Salinas Pump Station, Salinas Treatment Facility Storage and Recovery Diversion and Storage Sites

The Proposed Project would alter the operation of the Salinas Treatment Facility in terms of the amounts and types of water stored at the facility. Specifically, agricultural wash water, which is currently treated at the Salinas Treatment Facility, would be diverted to the Regional Treatment Plant during peak irrigation time periods and managed to meet the peak summer demand season by storing winter flows in the existing ponds at the Salinas Treatment Facility. In the summer months, both the incoming agricultural wash water and the stored storm water would be directed to the Proposed Project, allowing production of purified recycled water for groundwater replenishment in the Seaside Basin and increased tertiary recycled water production for CSIP crop irrigation. Urban storm water runoff from the City of Salinas would be routed to the Salinas Treatment Facility for seasonal storage and recovered back to the Salinas Pump Station for conveyance to the Regional Treatment Plant during the peak irrigation months.

These proposed changes in use of the Salinas Treatment Facility would locally alter the quantity and quality of percolation, which would affect the quantity and quality of Salinas River flow and groundwater recharge in the Salinas Valley Groundwater Basin in the vicinity of the Salinas Treatment Facility, as described in detail in **Appendix N** (Todd Groundwater, 2015b). However, those effects should be considered in a regional context because surface and groundwater throughout the northern Salinas Valley area are intensively managed as a single, interconnected system. The combined beneficial effects of all elements of the Proposed Project on regional groundwater pumping, water levels, and seawater intrusion of the Salinas Valley Groundwater Basin are discussed below. Effects of the Proposed Project on operation and yield of the Salinas Valley Water Project's Salinas River Diversion Facility and associated reservoir releases are described in the **Section 4.11, Hydrology and Water Quality: Surface Water** and in the Salinas River Inflow Impacts Report in **Appendix O** (Schaaf & Wheeler 2015). Potential local hydrologic impacts related to decreased groundwater recharge at the Salinas Treatment Facility and effects on local well yields are evaluated in this section.

Because the local groundwater impacts stem from changes in the amount of water percolated at the Salinas Treatment Facility, Todd Groundwater first established the assumptions about existing percolation at the facility, or the baseline (see **Section 4.10.2.3,** under the subheading "Salinas Treatment Facility: Existing Operations and Groundwater Relationship"). As described in that section, two baselines were established:

(1) a 2013 baseline representing a drought year and the conditions that existed at the time the Notice of Preparation was published; and

(2) a 2017 baseline that was considered to better represent the conditions that would occur when the Proposed Project commences operating and a more normal or wet hydrologic year.

Todd Groundwater then calculated the amount of percolation by month and year type for each potential example scenario of operation of the Proposed Project. The analysis depended on various assumptions about the distribution of percolation among the various ponds, basins and drying beds at the Salinas Treatment Facility which is described in **Section 4.10.2.3**, above. This analysis compares conditions under the Proposed Project with the two baseline conditions of pond percolation to determine if there would be a substantial change in groundwater levels and recharge that would result in a significant impact.

Percolation Patterns at the Salinas Treatment Facility

At the Salinas Treatment Facility, water percolates from Ponds #1, #2 and #3, the rapid infiltration beds, and the drying beds, but percolation rates vary substantially among those areas. Therefore, percolation under existing and Proposed Project conditions were estimated for each area separately using available data. The aeration pond is lined, therefore, its percolation is assumed to be negligible. Percolation from Ponds #1, #2, and #3 historically declined due to accumulation of fine-grained material and/or biofilms on the pond bottoms. As annual inflows have continued to increase and have become year round, the ponds have not completely dried out at any point from 2003 to 2013, and no maintenance (drying and disking) to improve percolation occurred during that time period. This led to reliance on the rapid infiltration and drying beds to provide additional disposal capacity. The drying beds have been operated more like percolation basins in recent years. Low berms divide the drying bed area into 54 cells or beds separated by low berms. Each bed is flooded to a depth of 1.0 to 1.5 feet then allowed to percolate, which takes anywhere from 5 days to several weeks (Cole, 2014c). The three rapid infiltration beds are long, narrow basins that occupy a strip along the river side of Ponds #1, #2, and #3. They have consistently provided relatively high rates of percolation but cover only a small area. Todd Groundwater used soils information and limited field data to estimate the amounts percolated at each area during 2013 and/or 2014 that increased the understanding of the relative proportions of percolation from each of the areas of the Salinas Treatment Facility. The detailed analysis is provided in **Appendix N** and the results were used to better characterize the impacts of changes at the Salinas Treatment Facility on groundwater resources.

Decreased Groundwater Recharge and Local Well Yields

To address local impacts on groundwater levels and wells near the Salinas Treatment Facility, Todd Groundwater first assessed the existing operations and developed two baseline scenarios as described in **Section 4.10.2**. Some of the water that percolates from the Salinas Treatment Facility flows downward through gaps in the Salinas Valley Aquitard and becomes recharge to the 180-Foot aquifer, which is one of several aquifers tapped by water supply wells in the northern Salinas Valley. A decrease in percolation would decrease recharge and tend to lower groundwater levels in wells near the Salinas Treatment Facility that pump from the 180-Foot aquifer. If the decline in water levels were large, it could impact groundwater availability to well owners by physically damaging wells or by decreasing their pumping rates.

These impacts stem from changes in the amount of water percolated at the Salinas Treatment Facility that would occur due to implementation (operation) of the Proposed Project. Todd Groundwater based their assessment of the Proposed Project on estimates of the monthly use of source waters under several operating scenarios related to the status of the drought reserve (See the **Section 2.7.1 Project Description** for a description of the source water availability and assumed diversion scenarios). In addition, the amount of water proposed to be sent to, or pumped from, the Salinas Treatment Facility for each month of the year was used, including monthly inflows and outflows in normal/wet years and in drought years.

Todd Groundwater calculated the amount of percolation by month and year type for each potential example scenario of operation of the Proposed Project. The analysis made certain assumptions about the distribution of percolation among the various ponds, basins and drying beds at the Salinas Treatment Facility which are described in **Section 4.10.2.1**, above.

Change in Percolation Volumes

Operation of the Salinas Treatment Facility would change substantially under the Proposed Project. In spite of new inflows of urban storm runoff, total annual inflow would decrease substantially because agricultural wash water inflows would be diverted to the Regional Treatment Plant during half the year. The drying beds and rapid infiltration beds would no longer be needed. The primary purpose of the Salinas Treatment Facility would switch from disposal to storage; any water that does not percolate or evaporate during the November-April storage season would be pumped back out to supply the Proposed Project. Only Ponds #1, #2 and/or #3 would be used for storage. The effect of reoperation under the Proposed Project would depend on the amount of percolation that continues to occur during the storage and pump-out seasons. This amount can be determined from monthly water balance calculations for the ponds, given the percolation rates estimated by Todd Groundwater.

Table 4.10-13, Proposed Project Salinas Treatment Facility Water Balance in Normal/Wet Years, below, shows the monthly pond water balance in normal/wet years, and **Table 4.10-14**, shows the balance during drought years. Inflows of agricultural wash water and Salinas urban storm runoff were obtained from the Salinas River Inflows Impact Report (Schaaf & Wheeler, 2015). The rainfall and evaporation rates in **Table 4.10-13** are average annual rates, and the rates in **Table 4.10-14, Proposed Project Salinas Treatment Facility Water Balance in Drought Years** are the drought year rates. The percolation rate from Ponds #1, #2, and #3 equals the rate of 140 AF per month estimated from 2014 data adjusted to be consistent with 2013 percolation.

Table 4.10-13
Proposed Project Salinas Treatment Facility Water Balance in Normal/Wet Years

Month	Agricultural Wash Water (AF) Total Available	Agricultural Wash Water (AF) Sent to STF	Salinas Urban Storm Water Inflow (AF)	Rainfall Rate (in)	Rainfall Volume (AF)	Pond Evaporation Rate (in)	Pond Evaporation Volume (AF)	Pumped Outflow to RTP (AF)	Ponds 1-2-3 Percolation (AF)	Pond Storage (AF)
DEC										353
JAN	156	156	52	2.62	25	1.21	12	0	140	435
FEB	158	158	41	2.35	23	1.54	15	0	140	502
MAR	201	201	34	2.11	20	2.88	28	0	140	590
APR	307	307	16	1.10	11	4.08	40	0	140	745
MAY	311	0	2	0.30	3	4.56	44	190	140	376
JUN	391	0	0	0.08	1	5.16	50	190	136	0
JUL	435	0	0	0.02	0	4.47	0	0	0	0
AUG	444	0	0	0.04	0	4.30	0	0	0	0
SEP	367	0	2	0.17	2	3.20	4	0	0	0
OCT	410	0	8	0.57	6	2.75	14	0	0	0
NOV	329	329	23	1.41	14	1.50	15	0	140	212
DEC	223	223	47	2.35	23	1.23	12	0	140	353
Total (AF):	3,732	1,374	225	13.12	128	36.88	233	380	1,113	
Percent of Salinas Treatment Facility outflow:							14%	22%	64%	

Notes: AF = acre-feet; RIB = rapid infiltration basin; in = inches; STF = Salinas Treatment Facility; RTP = Regional Treatment Plant; ponds 1-2-3 area = 104.3 acres; drying beds and RIBs inactive; agricultural wash water inflows are the expected amounts in 2017; rainfall and evaporation are long-term averages; ponds 1-2-3 percolation rate = 0.044 feet per day; aeration pond area = 12.4 acres, which is included in rain and evaporation but not percolation.

Table 4.10-14
Proposed Project Salinas Treatment Facility Water Balance in Drought Years

Month	Agricultural Wash Water (AF)		Salinas Urban Storm Water Inflow (AF)	Rainfall		Pond Evaporation		Pumped Outflow to RTP (AF)	Ponds 1-2-3 Percolation (AF)	Pond Storage (AF)
	Total Available	Sent to STF		Rate (in)	Volume (AF)	Rate (in)	Volume (AF)			
DEC										264
JAN	156	156	17	1.04	10	1.90	18	0	140	289
FEB	158	158	14	0.56	5	2.16	21	0	140	306
MAR	201	201	11	0.41	4	3.16	31	0	140	352
APR	307	307	5	0.27	3	4.30	42	0	140	485
MAY	311	0	1	0.01	0	4.99	49	60	140	238
JUN	391	0	0	0.04	0	4.26	41	60	137	0
JUL	435	0	0	0.00	0	3.73	0	0	0	0
AUG	444	0	0	0.02	0	3.87	0	0	0	0
SEP	367	0	1	0.07	1	3.93	1	0	0	0
OCT	410	0	3	0.15	1	3.10	4	0	0	0
NOV	329	329	8	0.47	5	1.99	19	0	140	182
DEC	223	223	16	0.21	2	1.95	19	0	140	264
Total (AF):	3,732	1,374	75	3.26	32	39.34	246	120	1,114	
Percent of Salinas Treatment Facility outflow:							17%	8%	75%	

Notes: AF = acre-feet; RIB = rapid infiltration basin; in = inches; STF = Salinas Treatment Facility; RTP = Regional Treatment Plant; ponds 1-2-3 area = 104.3 acres; drying beds and RIBs inactive; wash water inflows are the expected amounts in 2017; rainfall and evaporation are 2013 values; ponds 1-2-3 percolation rate = 0.044 feet per day; aeration pond area = 12.4 acres, which is included in rain and evaporation but not percolation.

Annual percolation from the Salinas Treatment Facility would be approximately 1,110 AFY in normal and wet years (**Table 4.10-13**), which is 2,300 AFY less than the 3,400 AFY of percolation estimated in the 2017 baseline condition. The proportion of percolated water that seeps into the Salinas River (80%) would remain about the same as under baseline conditions because the center of percolation volume would remain under Ponds #1, #2, and #3. The drying beds are estimated to have a lower percolation rate than the ponds, and the rapid infiltration basins have a significantly smaller size than the ponds. Therefore, seepage into the Salinas River would be approximately 890 AFY (1.2 cfs), and recharge to groundwater would be approximately 220 AFY.

Percolation from the Salinas Treatment Facility would be more seasonally variable than under either baseline condition. The maximum change in percolation would occur during July through October, when percolation would be zero. Seepage into the Salinas River follows a short subsurface flow path that would respond quickly to changes in percolation. Thus, during July through October, seepage into the river would decrease by 3 cfs. During November through June, seepage into the river would be about 1.9 cfs, or about 1.1 cfs less than under baseline conditions. In drought years, annual percolation would decrease by about 2,230 AFY. Monthly river flow would decrease by 1.1 to 3.0 cfs depending on the month (same as in normal/wet years), and the annualized average decrease would be 2.5 cfs.

Recharge to the 180-Foot aquifer might also vary somewhat seasonally, but by less than the variations in pond percolation. This is because the relatively low average permeability along the downward flow path would tend to smooth out short-term fluctuations in pond percolation. For the purpose of evaluating water supply and well impacts, the change in average annual percolation is a reasonable basis for comparison with baseline conditions. The evaluation of impacts on river flow assumes a year-round decrease of 3 cfs, which represents a worst-case scenario as described in the Salinas River Inflows Impact Report (Schaaf & Wheeler, 2015).

Uncertainty of Change in Percolation Volumes

The above estimates of percolation from Ponds #1, #2, and #3 under Proposed Project operation are subject to substantial uncertainty. The ranges of uncertainty for rapid infiltration basin and drying bed percolation are quite large, and the midpoints of those ranges were used in calculating the "best" estimate of the percolation rate from Ponds #1, #2, and #3. In addition, the resulting percolation rate was increased by 20% to make it consistent with annual percolation volumes observed during 2013. The recoverable yield of water stored in Ponds #1, #2, and #3 is quite sensitive to the percolation rate, because percolation occurs throughout the storage and pump-out periods (November to June). To illustrate this sensitivity, plausible alternative estimates of percolation and yield were calculated using the 2014 percolation rate without the 20% adjustment. The 2014 estimated percolation rate from Ponds #1, #2, and #3 is 103 AF per month, and the water balance results for Proposed Project operation under normal/wet years can be summarized as follows: recoverable storage pumped for Proposed Project use during May to June is 620 AF; total percolation is 830 AFY, of which 660 AFY seeps to the Salinas River and 170 AFY recharges the 180-Foot aquifer. During drought years, total annual percolation is only slightly less than during wet/normal years because the duration of pond inundation would be about the same. Recoverable storage would be only about 400 AF, however, due largely to decreased rainfall and storm water inflows.

Change in Groundwater Levels

Compared with 2017 baseline conditions (**Tables 4.10-2** and **4.10-3**) annual pond percolation under Proposed Project conditions (**Tables 4.10-13** and **4.10-14**) would decrease by 2,300 AFY, of which 460 AFY would be a decrease in recharge to the 180-Foot aquifer. Recharge from Salinas Treatment Facility pond percolation to the 180-Foot aquifer occurs over a broad area due to the low permeability of the Salinas Valley Aquitard. The ponds are 1.5 miles long, and if 460 AFY of recharge is assumed to be distributed uniformly over a circular area with a radius of 1.5 miles, it would raise water levels in the 180-Foot aquifer by approximately 1.3 feet. Conversely, a decrease in percolation by that amount would tend to lower water levels by 1.3 feet.

The median elevation of the top of the screen in the 23 wells used to monitor water levels in the 180-Foot aquifer is 160 feet below sea level, which indicates the lower limit of the Salinas Valley Aquitard in this area. (Feeney, 2014 as cited in Todd Groundwater, 2015c in **Appendix N**). The water level in wells screened in the 180-Foot aquifer near the Salinas Treatment Facility is approximately 18 feet below sea level, or 142 feet above the top of the screen in a typical well. The 180-foot Aquifer has a seasonal variation of 10 to 20 feet (difference in water level between August and February). A decline of 1.3 feet would not lower the water level to below the top of a typical well screen, nor exceed the seasonal variation in the aquifer. Therefore, the Proposed Project would not result in any interrupted water supply due to screen corrosion or pump failure because those conditions would not occur. Performance curves for typical deep-well turbine pumps indicate that a change in water level of 1.3 feet would in most cases decrease the pump output by three to four percent (Driscoll, 1986; Goulds Water Technology, 2014 as cited in Todd Groundwater, 2015c in **Appendix N**). This small decrease in pump output can typically be accommodated by increased pumping duration. Based on the above analysis, the impact due to changes to water levels in local wells would be less than significant during normal and wet years.

The change in recharge to the 180-Foot aquifer during drought years (i.e., under the 2013 baseline conditions) would be about 420 AFY less than under the 2017 baseline conditions, which is a slightly smaller impact than during normal and wet years. Impacts on local wells would therefore also be less than significant assuming the 2013 baseline.

All Other Project Components/Overall Regional Impacts on Salinas Valley Groundwater Basin

The Proposed Project would reduce groundwater pumping by the wells currently being used to supplement tertiary recycled water and Salinas River water to irrigate the CSIP area. The amount of new water that is proposed to be provided for CSIP irrigators would be between 4,500 and 4,750 AFY during normal and wet years, and up to 5,900 AFY during drought conditions. This provision of new irrigation water would result in a reduction in pumping from the Salinas Valley Groundwater Basin. Specifically, MRWPCA operates the CSIP irrigation system and currently uses supplemental wells that draw water almost exclusively from the 400-Foot aquifer to augment recycled water and surface water supplies (a small amount from the Eastside Aquifer). In addition, this new recycled water availability may also result in some, albeit minor, recharge to the 180-Foot aquifer due to percolation of irrigation water through the soils to the 180-Foot aquifer.[27]

Average well water use in the CSIP area during 2009-2013 as reported by MRWPCA is provided in **Table 4.10-15, Five Year Average Castroville Seawater Intrusion Project Area Well Water Use (2009-2013).** This is the estimated amount of pumping that can be offset by making increased deliveries of tertiary treated recycled water to the CSIP area. A portion of this demand would be satisfied by making modifications to the SVRP. In addition, during dry years when there would be less or no Salinas River Diversion Facility diversions available and when irrigation demand is high due to lack of rainfall, the CSIP area may use a larger quantity of water that would be equal to the amount of a proposed "drought reserve," excess purified recycled water previously injected into the Seaside Basin. The "drought reserve" excess tertiary water available during any irrigation season would be the total amount that has been banked in the Seaside Basin, above the typical subsurface replenishment applications (above 3,500 AFY water supply yield) that can be delivered to farmers, up to 1,000 acre feet.

Table 4.10-15
Five Year Average Castroville Seawater Intrusion Project Area Well Water Use (2009-2013)

Five Year Average Castroville	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total (AFY)
Seawater Intrusion Project Area Well Water Use in acre-feet (AF)	448	195	304	440	324	606	476	504	300	76	233	354	**4,260**
Source: MRWPCA, October 2014.													

The wells in the CSIP area, which are shown on **Figure 4.10-9**, **Castroville Seawater Intrusion Project Area,** are the wells whose production would be reduced or eliminated by delivering the additional crop irrigation water produced by the Proposed Project. All of the wells in the CSIP area are in the 400-Foot aquifer. Well 01C1 and Well 02A2 are in the Eastside aquifer which is an unconfined aquifer (Montgomery Watson, 1993).

Changes in recharge due to source water diversions would be an order of magnitude lower than the CSIP area well pumping reductions; this would only slightly reduce the Proposed Project's beneficial impacts of delivering more tertiary recycled water to growers within the CSIP area (Phyllis Stanin, Todd Groundwater, personal communication, October 23, 2014).

The impact of decreased 180-Foot aquifer recharge near the Salinas Treatment Facility on the regional groundwater balance and seawater intrusion is less than significant because it is more

[27] Recharge to the 180-Foot Aquifer would only occur in some areas of the irrigation system where tile drains are not present or are not continuous, and where the uppermost aquiclude, above the 180-Foot Aquifer, is discontinuous or not present.

than offset by other elements of the Proposed Project, specifically decreased groundwater pumping in the CSIP area. The Proposed Project is expected to increase the delivery of tertiary recycled water to CSIP growers during wet and normal years by 4,500 to 4,750 (see **Appendix B**). During drought conditions, the Proposed Project could provide up to 5,900 AFY of recycled water to growers for crop irrigation. The growers use water from three sources: tertiary recycled water from the Salinas Valley Reclamation Plant at the Regional Treatment Plant, Salinas River water supplied by the Salinas River Diversion Facility, and groundwater from 15 wells within the CSIP service area. Since the Salinas River Diversion Facility came on-line in 2010, CSIP groundwater use has ranged from 2,700 to 6,500 AFY. Thus, the Proposed Project would be able to decrease CSIP pumping to zero in most years and to a small fraction of existing pumping in the remaining years. The decrease in groundwater pumping in the CSIP area would be about ten times greater than the decrease in recharge at the Salinas Treatment Facility and would thus have a net beneficial impact with respect to seawater intrusion in the coastal region.

Locally, it is unclear whether the decrease in 400-Foot aquifer pumping near the CSIP wells would raise water levels in the 180-Foot aquifer beneath the Salinas Treatment Facility enough to completely offset the effect of decreased recharge. The Castroville Seawater Intrusion Project wells are all screened in the 400-Foot aquifer or the East Side Subbasin and are located 2.75 to six miles north to northwest of the Salinas Treatment Facility (between Salinas and Castroville). The CSIP wells are inland of the intrusion front in the 400-Foot aquifer but beneath the intruded part of the 180-Foot aquifer. In the 180-Foot aquifer, the seawater intrusion front is 1.5 miles northwest of the Salinas Treatment Facility. Locally, leakage between the 180-Foot and 400-Foot aquifers is limited due to the intervening aquitard, but the two depth intervals are hydraulically connected in the East Side Subarea of the Salinas Valley Groundwater Basin that is located approximately 4½ miles north of the Salinas Treatment Facility.

Impact Conclusions

Local changes to recharge and water levels and effects on nearby wells due to Proposed Project operations would be less than significant due to diversions of surface water from the Reclamation Ditch, Tembladero Slough, and Blanco Drain, and the proposed diversions of agricultural wash water and storm water to the Regional Treatment Plant. The Proposed Project would decrease CSIP area pumping to zero in most years and to a small fraction of existing pumping in the remaining years. The decrease in groundwater pumping in the CSIP area is estimated to be more than ten times greater than the decrease in recharge due to diversions of source water; therefore, the Proposed Project would have a net beneficial impact with respect to seawater intrusion and overall groundwater storage and levels in the Salinas Valley Groundwater Basin.

Impact GW-4: <u>Operational Groundwater Depletion and Levels: Seaside Basin.</u> Operation of the Proposed Project would not deplete groundwater supplies in the Seaside Basin nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater levels in the Seaside Basin. (Criterion a) (Less than Significant)

As discussed above, Todd Groundwater conducted a detailed Draft Recharge Impacts Assessment for the Proposed Project to determine if operation of the Proposed Project would result in a significant groundwater impact according the significance criterion a, above. This Recharge Impacts Assessment is provided in **Appendix L**. To determine whether the impact would be significant, Todd Groundwater analyzed the potential for groundwater mounding, change in groundwater gradients, or lower groundwater levels such that nearby municipal or private groundwater production wells experience a reduction in well yield or physical damage (due to exposure of well screens) resulting in a well not being capable of supporting existing land uses or planned uses for which permits have been granted.

Because the Proposed Project would provide additional water for downgradient groundwater extraction, it would result in both higher and lower water levels in existing basin wells over time depending on the timing of extraction and the buildup of storage in the basin. HydroMetrics examined potential changes in water levels for eight key production wells for a 33-year simulation period (including 25 years of Proposed Project operation). The results of the groundwater modeling by HydroMetrics were that simulated water levels sometimes would be lower under the Proposed Project scenario because of increased pumping at existing extraction wells. However, simulated water levels would be lowered only about ten feet or less and would be lowered for a relatively short duration, typically for a few months. In addition, simulated water levels would be generally higher than pre-project levels. As such, none of the municipal or private production wells would experience a reduction in well yield or physical damage. All existing wells would be capable of pumping the current level of production or up to the permitted production rights.

In addition, analysis of the closest shallow coastal well (PCA-West Shallow) indicates that increased pumping of purified recycled water would not result in water levels falling below elevations protective of seawater intrusion. Although it would take time for the beneficial impacts of recharge to reach coastal pumping wells, the increased pumping of nearby Paso Robles production wells would only reduce water levels about two feet near the coast. The closest coastal well, PCA-W Shallow, would remain above Protective Elevations for seawater intrusion.

In addition, Todd Groundwater found that there would be no adverse impacts to the quantity of groundwater resources. Because the Proposed Project would only recover up to the amount of purified recycled water injected into the Seaside Basin aquifers, there would be no impact related to long-term change in groundwater storage because the purified recycled water being used for groundwater replenishment would eventually be extracted for municipal use.

Impact GW-5: Operational Groundwater Quality: Salinas Valley. Operation of the Proposed Project would not degrade groundwater quality in the Salinas Valley. (Criterion b) (Less than Significant/Beneficial)

Source Water Diversion and Storage Sites

Salinas Pump Station, Salinas Treatment Facility Storage and Recovery

The Salinas Treatment Facility is located adjacent to the Salinas River about three miles southwest of the City of Salinas. The plant is owned and operated by the City of Salinas to treat and dispose of wastewater, 80 to 90% of which is used to wash and prepare vegetable crops at industrial food processing facilities in Salinas. The Salinas Treatment Facility consists of an aeration pond for treatment of incoming water and three large percolation ponds that dispose of water by percolation and evaporation. Additional disposal capacity is provided by drying beds and by temporary rapid infiltration basins located between the main ponds and the Salinas River channel. **Figure 4.10-3** shows the locations of the ponds, rapid infiltration beds, drying beds, Salinas River, shallow monitoring wells at the Salinas Treatment Facility, and nearby irrigation wells.

Water that percolates from the ponds either flows a short distance through the subsurface and emerges as seepage into the Salinas River or flows downward to the shallow aquifer that is present at depths of 0 to 80 feet below ground. As discussed previously, the Salinas Valley Groundwater Basin in this area contains a shallow aquifer, or A-Aquifer, above a regionally extensive aquitard (i.e., a bed of low permeability adjacent to an aquifer). The shallow aquifer is not used directly as a source of water supply, but gradual downward percolation from the shallow aquifer is a source of recharge to the 180-Foot Aquifer, which is used for water supply in the Salinas region.

Wastewater currently treated at the Salinas Treatment Facility is one of several supplemental sources of water proposed for recycling and reuse by the Proposed Project. Other source waters include municipal wastewater, agricultural tile drainage and runoff in Blanco Drain, mixed runoff and tile drainage in the Reclamation Ditch and Tembladero Slough, and urban runoff/storm water from parts of Monterey and Salinas. Detailed descriptions and maps of the source waters and diversion methods are included in **Section 2.7** in **Chapter 2, Project Description**. These sources would be diverted to the municipal wastewater system in varying amounts depending on availability, demand, and conditions of the various permits and agreements. The source waters would all be conveyed to the Regional Treatment Plant. Some of the secondary effluent from the Regional Treatment Plant would be treated to produce tertiary recycled water for delivery to agricultural users in the CSIP service area (see map in **Figure 4.10-9**). Some of the secondary effluent would be treated at an AWT Facility to be built within the Regional Treatment Plant site. The purified recycled water from the AWT Facility would be conveyed south for recharge via subsurface application into the Seaside Basin. The injected water would augment the basin yield to replace existing sources of potable water that serve the Monterey Peninsula area. Monthly water balances showing inflows and outflows to and from the Salinas Treatment Facility under existing conditions are presented in **Section 4.10.2.1** above.

The Proposed Project would alter the operation of the Salinas Treatment Facility. Currently, the only inflow is industrial wastewater produced by vegetable washing and related agricultural processing facilities in Salinas (agricultural wash water). The only outflows are evaporation and percolation. Under the Proposed Project, agricultural wash water would only be sent to the Salinas Treatment Facility during November through April, when irrigation demand is low. During May through October, it would be sent directly to the Regional Treatment Plant for immediate treatment and recycling. Water stored in the Salinas Treatment Facility ponds over the winter would be pumped out and sent to the Regional Treatment Plant for recycling by the Proposed Project. Storm water runoff from the southern part of Salinas would be added as a new source of inflow to the Salinas Treatment Facility ponds.

The effect of changes to percolation at the Salinas Treatment Facility percolation on water quality in the Salinas Valley Groundwater Basin depends on the concentrations of individual chemical constituents in the Salinas Treatment Facility ponds compared to existing groundwater concentrations and applicable water quality objectives. **Table 4.10-16, Comparison of Water Quality in Salinas Treatment Facility Ponds and Groundwater** compares median concentrations of chloride, nitrate, total dissolved solids and phosphorus for the Salinas Treatment Facility ponds and groundwater. The concentrations of some of these constituents in treated agricultural wash water (i.e., pond water) exceed both existing water quality in the groundwater and groundwater objectives. The data in the table[28] is summarized from various monitoring programs with differing suites of constituents and periods of record. Aquifer-specific data for groundwater quality were not available, and data in the table reflect a combination of 180-Foot and 400-Foot Aquifer groundwater concentrations. In spite of these limitations in

[28] Average concentrations are often influenced by skewed distributions (for example, high outliers for nitrate).

available data, the table reveals several large contrasts in water quality conditions that can be used to infer impacts from changes in Salinas Treatment Facility percolation on water quality.

As discussed in detail in **Section 4.11**, seepage into the Salinas River derived from existing Salinas Treatment Facility pond percolation consistently exceeds the surface water quality objective for nitrate, occasionally degrades Salinas River water quality with respect to total dissolved solids and chloride, and probably continually degrades river quality with respect to phosphorus. Because the Proposed Project would decrease the annual volume of water percolated at the Salinas Treatment Facility, it would decrease the input of those contaminants to the river and have a beneficial impact on river water quality.

Groundwater quality impacts would be greatest near the Salinas Treatment Facility, and for this analysis the impact area previously described for water level impacts was also used for water quality impacts: a circle with a 1.5-mile radius surrounding the Salinas Treatment Facility. The 180/400 Foot Subarea water balance in the Salinas Valley Integrated Groundwater and Surface Water Model (the only applicable groundwater model for most of the Salinas Valley Groundwater Basin) indicates that groundwater recharge from rainfall and irrigation return flow averages 0.76 ft/yr, which is 38% of total groundwater recharge. Groundwater recharge from Salinas Treatment Facility percolation averages 0.12 ft/yr when distributed over a 1.5-acre circular area centered at the ponds. Recharge from Salinas Treatment Facility percolation therefore amounts to approximately six percent of total recharge. This means that water quality impacts of changes in Salinas Treatment Facility percolation would be substantially diluted by mixing with other sources of recharge.

Chloride is a relatively conservative solute, which means its concentration does not gradually decrease due to adsorption, degradation or mineral precipitation as it moves through the subsurface. The concentration in the Salinas Treatment Facility ponds is up to three times greater than the existing groundwater concentration, but only 0.9 to 1.2 times the recommended secondary MCL and management water quality objectives (see **Table 4.10-15**). This means that percolation of treated agricultural wash water from the ponds tends to degrade existing groundwater quality and could at most cause groundwater quality to slightly exceed the water quality objective. Therefore, a decrease in Salinas Treatment Facility pond percolation and associated groundwater recharge would probably have a small but beneficial impact on chloride concentration.

Table 4.10-16
Comparison of Water Quality in Salinas Treatment Facility Ponds and Groundwater

Water Source	Chloride (mg/L)	Nitrate (mg/L as N)	Total Dissolved Solids (mg/L)	Phosphorus (mg/L as P)	Notes
STF Ponds 1-3	301	4.5	1,090	--	Medians of 12 monthly samples during 2013. Total nitrogen converted to nitrate.
STF Ponds	237	5.9	1,228	27	Median of six samples collected during July 2013 to February 2014
Salinas River at South Davis Road (upstream of SIWTF)	70	7.0	618	0.1	CCAMP data. Medians of 92-100 samples during 1998-2011. Primarily low-flow data.
Blanco Drain[a]	274	66.0	2,003	<0.1	Median of monthly samples collected during July 2013-June 2014 for GWR Project source water investigation (Nellor Environmental Associates, 2015).
Groundwater	100	2.0	800	0.012	Chloride, nitrate and TDS from GeoTracker GAMA database. Medians of samples from 15-23 well locations between Salinas and the Salinas River. Dates vary. Combination of 180-Foot and 400-Foot aquifers. Phosphorus is the median of 8 samples from the Pressure Area (Kulongoski and Belitz, 2011).
Water Quality Objectives for 180 Foot Aquifer					
Primary MCL	–	10	–	–	
Recommended Range Secondary MCL	250	–	500[d]	–	
Central Coast Basin Plan Median Objective[b] ("Management Objective")	250	1[c]	1,500	–	These median objectives serve as mechanisms for evaluating water quality management.

Notes:
CCAMP = Central Coast Ambient Monitoring Program; STF = Salinas Treatment Facility; MCL = Maximum Contaminant Level
GAMA = groundwater ambient monitoring and assessment
[a] Blanco Drain data used as a surrogate for shallow groundwater quality, for which direct measurements are not available.
[b] From Table 3-8 in the Bain Plan; are intended to serve as a water quality baseline for evaluating water quality management in the basin, but are at best representative of gross areas only. Application of these objectives must be consistent with the objectives previously specified in the Basin Plan and synchronously reflect the actual ground water quality naturally present.
[c] The objective is for Total Nitrogen.
[d] The lower secondary drinking water standard is shown. Agricultural crops can experience "increasing problems" at electrical conductivity values that correspond to approximately 500-2,000 mg/L of TDS.

The nitrate concentration in Salinas Treatment pond water is two to three times greater than the existing ambient groundwater concentration. The pond water concentration is lower than the primary MCL-based objective, but four to six times greater than the management water quality objective, assuming that the total nitrogen in the pond water is all in the form of nitrate. However, existing nitrate concentrations in the 180-Foot Aquifer exceed the total nitrogen management water quality objective by a factor of two. Recharge from pond percolation presently tends to exacerbate an existing degraded condition. Therefore, a decrease in pond percolation would probably have a small beneficial impact on nitrate concentrations in the groundwater.

Total dissolved solids tend also to be fairly conservative during subsurface transport. The total dissolved solids concentration in pond water is 1.5 to 1.6 times greater than the ambient groundwater concentration. It is 2 to 2.5 times greater than the recommended secondary MCL-based objective for drinking water but less than the management water quality objective. Recharge from pond percolation presently tends to degrade groundwater quality with respect to total dissolved solids and potable use. Therefore, a decrease in pond percolation resulting from the Proposed Project would tend to improve groundwater quality and result in a beneficial impact.

Finally, the Central Coast RWQCB has not adopted a water quality objective for phosphorus in groundwater. It is not a constituent regulated by drinking water standards or addressed for the agricultural supply beneficial use, but would be subject to the Anti-Degradation Policy. Therefore, changes in phosphorus concentrations in the 180-Foot Aquifer caused by decreased Salinas Treatment Facility pond percolation would not affect beneficial uses according to the Basin Plan; however, the phosphorus concentrations in treated water are higher than in the groundwater so reducing the pond percolation would also be expected to lower phosphorous levels in the groundwater.

All Other Project Components/Overall Regional Impacts on Salinas Valley Groundwater Basin

Other source water diversion sites would not divert enough to change groundwater levels, storage, or recharge affecting seawater intrusion as discussed further in impact GW-3, above. No new or modifications to recharge or percolation of water from the Regional Treatment Plant site (including Proposed Project AWT Facility and SVRP modifications) would affect Salinas Valley Groundwater Basin quality. Source water diversions from Tembladero Slough, Reclamation Ditch and Blanco Drain would have a less that significant impact on groundwater quality.

As previously discussed, the Proposed Project would decrease CSIP pumping to zero in most years and to a small fraction of existing pumping in the remaining years. The decrease in groundwater pumping in the CSIP area would be about ten times greater than the decrease in recharge at the Salinas Treatment Facility and therefore, the Proposed Project would have a net beneficial impact with respect to seawater intrusion and overall groundwater storage and levels in the Salinas Valley Groundwater Basin. The Proposed Project would increase the amount of irrigation water available to the growers. The tertiary recycled water would comply with statutory and regulatory requirements for the production and use of recycled water per California Water Code Sections 13500 – 13577 and California Code of Regulations, Title 22, Sections 60301 – 60357. In addition, the increased use of the tertiary-treated recycled water on the existing CSIP area would not adversely affect the groundwater quality in the 180-Foot or 400-Foot Aquifers for the following reasons:

- the 180-/400-Foot Aquifers are confined (an aquitard overlies these aquifers).
- the shallow aquifer (sometimes called the A-Aquifer) is not used for municipal or agricultural uses.
- the farm fields receiving recycled water for irrigation are nearly all under-drained (artificially drained with tiles set at frequent intervals), and the leachates from excess irrigation end up in the drain tiles and ultimately into Tembladero Slough or Blanco Drain, and are discharged to Monterey Bay along with the other slough waters.

The technical analysis in **Appendix S** presents information on the salinity in the recycled water, describes existing use of recycled water by growers in the CSIP area and analyzes how the addition of the Proposed Project source waters to the recycled water supply may affect the quality of recycled water delivered to growers. No other Proposed Project components sites would overly the Seaside Groundwater Basin such that they would have the potential to affect its water quality. No other components would result in adverse operational impacts on groundwater quality in the Salinas Valley Groundwater Basin.

Impact Conclusions

The Proposed Project operations would have a less-than-significant impact on the water quality in the Salinas Valley Groundwater Basin. This conclusion is based on the lack of recharge or percolation of contaminated waters and the beneficial impacts of diversions of source waters of marginal water quality, and the delivery of new recycled water to the crop irrigation demands in the CSIP area.

Impact GW-6: Operational Groundwater Quality: Seaside Basin. Proposed Project operations would not degrade groundwater quality in the Seaside Basin, including due to injection of purified recycled water into the basin. (Criterion b) (Less than Significant/Beneficial)

All Project Components

Geochemical Compatibility of Purified Recycled Water and Groundwater

When two water types with different water chemistry are mixed (such as the Proposed Project purified recycled water and groundwater), the compatibility of the waters requires examination. Geochemical reactions in the groundwater system in the vicinity of the well and in the aquifer beyond could potentially result in precipitation or dissolution of constituents (e.g., precipitation of silica or dissolution of metals). These reactions could contribute to clogging in the well and/or pore throats or alter groundwater quality thorough dissolution in the vadose zone or aquifer. In particular, if not addressed, subsurface application of purified recycled water in the vadose zone could lead to leaching of natural or anthropogenic constituents that could impact groundwater quality or lead to well scaling or biofouling.

Under the Proposed Project, the potential for geochemical incompatibility would be addressed at the proposed AWT Facility by including a stabilization step in the treatment process to ensure that the purified recycled water is stabilized and non-corrosive. Other groundwater replenishment projects similar to the Proposed Project provide chemical stabilization for these purposes. Further, no adverse impacts have been observed at the nearby ASR Project's wellfields where water injected in ASR wells has a different water chemistry than native groundwater; this water has some similar components of water chemistry to the Proposed Project purified recycled water that are relevant to compatibility.

To estimate geochemical issues that would need to be addressed through treatment design or operational adjustments at the AWT Facility, a geochemical assessment was performed using the data from the MRWPCA field program (Todd Groundwater, 2015c). Further, a pilot plant was constructed at the MRWPCA Regional Treatment Plant to test the ability of the proposed reverse osmosis (RO) system to remove impurities from the source waters that would be treated at the proposed AWT Facility. The Proposed Project pilot plant RO water was stabilized and provided to McCampbell Laboratories under chain of custody protocol to use in laboratory leaching tests on nine vadose zone core samples. The water extracted from the core samples (leachate samples) was analyzed for a suite of constituents to provide a preliminary estimate of leaching potential. These tests provide a conservative estimate of the potential for leaching constituents from the vadose zone during subsurface application associated with the Proposed Project. The analysis is considered conservative because the Proposed Project's pilot plant water is slightly more aggressive (as indicated by the negative value of the Langelier Saturation Index on Table 17 in **Appendix L**) than the anticipated full-scale AWT Facility purified recycled water.

Due to the unconsolidated nature of the core samples and limitations with extraction methods, the laboratory results were compromised by elevated turbidity in some of the leachate samples (Todd Groundwater, February 2015). Notwithstanding the limitations of the results, the leaching tests provided valuable information on which constituents represented the highest potential for leaching and identified potential geochemical reactions that warranted further investigation through geochemical modeling.

Geochemical modeling was conducted to analyze the potential for dissolution (leaching) of chromium, arsenic, and lead from the vadose zone sediments (including samples from the Aromas Sand and Paso Robles Aquifer). The modeling indicated that trace amounts of chromium adsorbed onto the hydrous ferric oxide coatings of the sand grains and thus represented the highest potential for leaching. However, this leaching does not represent a long-term effect due to the limited total amount of chromium available in the sediments. The maximum concentration in the zone of saturation was estimated to be about 4.0 µg/L after one year of injection – a concentration substantially below the total chromium primary drinking water MCL of 50 µg/L.

Although arsenic and lead were also determined to be present in vadose zone sediments, those constituents were more strongly adsorbed to the oxides than chromium. Consequently, only small amounts are predicted to be released into solution as the injected water flows through the Aromas Sand, resulting in sustained but low concentrations of about 4 µg/L for arsenic and approximately 0.7 µg/L for lead. Concentrations in the zone of saturation meet water quality standards. None of the analyses indicated that groundwater concentrations would exceed regulatory standards for any of the leached constituents.

Additional geochemical analyses indicated that aquifer clogging from calcite precipitation would be unlikely due to the low concentrations of calcium and bicarbonate. Extensive biofouling of injection wells was also evaluated and determined to be unlikely given that the low concentrations of nitrogen and phosphorus in the AWT Facility purified recycled water would not tend to stimulate microbial growth.

In addition to impacts from the vadose zone wells, the analysis examined the potential for impacts to the Santa Margarita Aquifer from recharge into deep injection wells. Results indicated that the potential for such impacts were unlikely. Risk of trace metal desorption during injection of purified recycled water into the Santa Margarita Formation was inferred from previous studies of injected Carmel River water. The two injected water types have similar pH and oxidation-reduction potential, and are therefore expected to have similar effects with respect to adsorption/desorption processes. Previous studies found no indications that significant metal concentrations would be released into solution, and those results can reasonably be extended to injection of the purified recycled water.

The following summarizes the key conclusions from the geochemical compatibility analyses described above:

- Chemicals associated with the former Fort Ord activities, including soluble nitroaromatic compounds (explosives), perchlorate, or certain organic constituents, were not detected (or for those that were detected, the samples were not indicative of actual groundwater quality) in soil core samples or groundwater samples and testing indicates Fort Ord activities have not contaminated groundwater near the proposed Injection Well Facilities site.

- Potential changes in injected purified recycled water quality beneath vadose zone wells from geochemical reactions between the purified recycled water and formation materials along vertical flow paths are small. The analysis of leaching of chromium, arsenic, and lead indicated that concentrations in the zone of saturation are expected to be very low and would meet water quality standards.
- Aquifer clogging by calcite precipitation is unlikely to be a problem for the Proposed Project. In the Aromas Sand, calcium and bicarbonate concentrations are below saturation levels. Ambient groundwater in the Paso Robles Formation is at saturation with respect to calcite, but given the pH of the purified recycled water, calcite would not be expected to precipitate.
- Biofouling would not likely pose a problem for the injection wells because the purified recycled water is very low in nitrogen and phosphorus and would not tend to stimulate microbial growth.
- Based on the water chemistry of the AWT Facility pilot plant water and observations from the ASR Project's wellfield, adverse impacts from geochemical incompatibility are unlikely in the Santa Margarita Aquifer in the vicinity of the deep injection wells.

None of the modeling results indicated that groundwater would be geochemically incompatible with the AWT Facility purified recycled water. Complete results of the geochemical analyses and modeling are presented in the draft report on the MRWPCA field program (Todd Groundwater, February 2015c).

Potential Interactions with Local Anthropogenic Groundwater Contamination

A search of the study area was conducted on the DTSC *EnviroStor* web site (www.envirostor.dtsc.ca.gov) and the SWRCB *Geotracker* web site (http://geotracker.waterboards.ca.gov). The goal of the search was to identify any potential industrial sites or activities that could contribute to groundwater contamination from previous site uses, spills, and/or chemical releases in the Proposed Project Injection Well Facilities study area.

Both *EnviroStor* and *Geotracker* listed the 28,016-acre Fort Ord Military Reservation as an active Federal Superfund site and listed munitions as the contaminant of primary concern. Additionally, *Geotracker* identified two adjacent sites on the former Fort Ord lands as gasoline contamination sites: (1) the 14th Engineers Motor Pool and (2) Building 511. In addition, groundwater contaminant sites 2/12, OU-1, OU-2, and OU-CTP are described in **Section 4.9.2.1** of the **Section 4.9, Hazards and Hazardous Materials,** and all are located over one mile north of the boundary of the Seaside Basin. These are active sites currently undergoing investigations and are located about 1.8 miles to the northeast of the Injection Well Facilities. However, all sites are outside of the Seaside Groundwater Basin and are not a threat to groundwater in the Proposed Project Injection Well Facilities area; nor would operation of the Injection Well Facilities or extraction from existing CalAm Wells result in groundwater quality impacts of these active sites.

Other environmental sites have been identified in the Seaside Groundwater Basin, including numerous leaking underground storage tank sites, but none were in the Proposed Project Injection Well Facilities area and none within areas affected by existing CalAm Seaside Basin Extractions. Specifically, there were no environmental contaminant sites identified in the area between Proposed Project recharge and downgradient extraction wells. Replenishment activities would not have any interaction with contaminant plumes outside of the cone of depression for the existing CalAm extraction wells; and thus would result in a less-than-significant impacts related to interactions with any off-site groundwater contaminant sites.

Statutory and Regulatory Water Quality Compliance Overview

An assessment conducted by Nellor (2015) reviewed the analytical results of source water monitoring, the water quality results of the AWT Facility pilot plant testing (using ozone, MF, and RO), the stabilized RO sample, information on the predicted performance and water quality of the proposed full-scale AWT Facility based on other existing groundwater replenishment projects, and related research/studies. Based on the results of that assessment, the Proposed Project would comply with the following (see **Chapter 3, Water Quality Statutory and Regulatory Compliance** and **Appendix D** for more information):

- SWRCB Regulations (for groundwater replenishment), including MCLs, NLs, total organic carbon, and other numeric water quality-based requirements; and
- Central Coast Basin Plan objectives and guidelines for protection of groundwater uses (MUN, AGR, and industrial use).

The Proposed Project purified recycled water would be treated and stabilized to meet all drinking water quality objectives. The concentrations of total dissolved solids and nitrogen in the purified recycled water would also meet Basin Plan objectives. Further, the Proposed Project purified recycled water is expected to be higher quality water than ambient groundwater with respect to total dissolved solids, chloride, and nitrate. As such, the Proposed Project would not result in the groundwater failing to meet groundwater objectives or beneficial uses. Rather, the Proposed Project recycled water would have a beneficial effect on local groundwater quality from the injection of high quality water that meets objectives and has low total dissolved solids and chloride concentrations.

A Salt and Nutrient Management Plan (SNMP) has been prepared for the Seaside Basin to comply with requirements in the SWRCB's Recycled Water Policy (HydroMetrics WRI, 2014). The SNMP was developed with basin stakeholder input through the Seaside Basin Watermaster and has been adopted by the MPWMD Board. The final SNMP has been submitted to the RWQCB. As documented in the SNMP and confirmed herein, ambient groundwater generally exceeds Basin Plan objectives for total dissolved solids in many areas of the basin, while nitrate and chloride concentrations generally meet Basin Plan objectives. As indicated by the water quality analyses of the stabilized AWT Facility pilot plant water (discussed above), total dissolved solids, nitrate, and chloride in the purified recycled water produced by the Proposed Project would meet Basin Plan objectives. Further, these concentrations would be generally lower than average concentrations in groundwater. As such, recharge of the Seaside Basin using the Proposed Project purified recycled water would not adversely impact salt and nutrient loading in the basin and would provide benefits to local groundwater quality related to salts (total dissolved solids and chloride).

Impacts on Seawater Intrusion

As demonstrated by the modeling by HydroMetrics (attached to **Appendix L** of this EIR) and discussed above in Impact GW-4, the Proposed Project is not expected to cause water levels to fall below elevations that are protective against seawater intrusion.

The Proposed Project would incorporate operational monitoring to track impacts on water levels from recharge and pumping. Real-time modifications can be incorporated into the operation of the Proposed Project to address any short-term water level declines, if needed. For example, during the primary pumping period, more water can be directed to the deeper aquifer where existing water level declines are more widespread.

The Proposed Project would provide basin replenishment to meet the primary objective of increasing basin production to replace a portion of the CalAm water supply as required by state orders. The impact analysis indicates that the Proposed Project would not exacerbate seawater intrusion. However, it is noted that seawater intrusion cannot be prevented by the Proposed Project alone. Water levels are below sea level at the coast in the Santa Margarita Aquifer and the Proposed Project would not raise levels in the Seaside Basin over the long term. However, the short term rise in water levels associated with the Proposed Project during the winter when pumping is less will prevent significant water level declines during the summer when pumping increases. A more complete analysis of water level impacts associated with the Proposed Project is provided in the HydroMetrics' Groundwater Replenishment Project Modeling Technical Memo (HydroMetrics WRI, 2015a).

Impact Conclusions

Based on the groundwater characterization, recent groundwater sampling results, stabilized pilot water quality/chemistry and projected AWT Facility purified recycled water quality, and results from the MRWPCA field program, the following conclusions were made in the relevant technical reports.

- Stabilized pilot plant water samples and projected AWT Facility purified recycled water meet SWRCB Regulations for groundwater replenishment projects and Basin Plan groundwater quality standards, including drinking water MCLs. Further, the treatment processes that would be incorporated into the proposed full-scale AWT Facility would be selected and operated to ensure that all water quality standards would be met in both the purified recycled water and groundwater. A monitoring program would document project performance.
- Stabilized pilot plant water samples and projected AWT Facility purified recycled water exhibit much lower concentrations of total dissolved solids and chloride than in ambient groundwater and would be expected to provide a localized benefit to groundwater quality. Such a benefit would expand over time with continuous replenishment from the Proposed Project wells.
- No documented groundwater contamination or contaminant plumes have been identified in the Proposed Project area. Therefore, replenishment associated with the Proposed Project would not exacerbate existing groundwater contamination or cause plumes of contaminants to migrate.
- Injection of AWT Facility purified recycled water would not degrade groundwater quality. A monitoring plan would be implemented to meet RWQCB and DDW requirements.
- The Proposed Project purified recycled water would be stabilized as part of the full-scale AWT Facility to ensure no adverse geochemical impacts. Geochemical modeling associated with the MRWPCA field program indicated that no adverse groundwater quality impacts are expected from leaching or other geochemical reactions.
- Modeling indicates that the Proposed Project would not lower water levels below protective levels in coastal wells and would not exacerbate seawater intrusion.

As summarized above and discussed in detail in **Appendices D** and **L**, the Proposed Project, including subsurface application of purified recycled water through both vadose zone wells and deep injection wells, would be required to comply with federal, state and local statutes and regulations established to protect water quality. The Proposed Project would have a beneficial impact related to salt and, in some cases, nutrient concentrations in groundwater and would have a less-than-significant impact on groundwater quality for all other constituents, including those related to the seawater intrusion conditions of the basin, the safety of the water supply for human consumption, and the beneficial use of the Seaside Basin. (Todd Groundwater, February 2015 and Nellor Environmental Associates, 2015).

4.10.4.5 Cumulative Impacts and Mitigation Measures

The geographic scope for cumulative impact analysis on groundwater resources consists of two primary groundwater basins that are located beneath the Proposed Project area, the Salinas Valley and Seaside Groundwater Basins.

The discussion of cumulative impacts is organized to address the combined impacts of the Proposed Project plus the MPWSP (with the 6.4 mgd desalination plant) and then to address the overall combined impacts of the Proposed Project and all relevant past, present and probable future projects identified on **Table 4.1-2, Project Considered for Cumulative Analysis (**see **Section 4.1, Introduction**):

- *Combined Impacts of Proposed Project Plus MPWSP* (with 6.4 mgd Desalination Plant) (referred to as the MPWSP Variant):[29] The CalAm Monterey Peninsula Water Supply Project includes: a seawater intake system; a source water pipeline; a desalination plant and appurtenant facilities; desalinated water conveyance facilities, including pipelines, pump stations, a terminal reservoir; and an expanded ASR system, including two additional injection/extraction wells (ASR-5 and ASR-6 Wells), a new ASR Pump Station, and conveyance pipelines between the wells. The CalAm Distribution Pipelines (Transfer and Monterey) would be constructed for either the MPWSP or GWR project. The overall estimated construction schedule would be from June 2016 through March 2019 for the combined projects, during which time the construction schedules could overlap for approximately 18 months (mid-summer 2016 through December 2017). The cumulative impact analysis in this EIR anticipates that the Proposed Project could be combined with a version of the MPSWP that includes a 6.4 mgd desalination plant. Similarly, the MPSWP EIR is evaluating a “Variant” project that includes the proposed CalAm Facilities (with the 6.4 mgd desalination plant) and the Proposed Project. The impacts of the Variant are considered to be cumulative impacts in this EIR. The CalAm and GWR Facilities that comprise the MPSWP Variant are shown in **Appendix Y**.
- *Overall Cumulative Projects:* This impact analysis is based on the list of cumulative projects provided on **Table 4.1-2** (see **Section 4.1**). The overall cumulative impacts analysis considers the degree to which all relevant past, present and probable future projects (including the MPSWP (with the 6.4 mgd desalination plant)) could result in impacts that combine with the impacts of the Proposed Project.

Combined Impacts of Proposed Project plus MPWSP (with 6.4 mgd Desalination Plant)

Construction Combined Impacts on Groundwater

During construction, impacts to groundwater would be limited to very small use of groundwater for construction employees and changes to drainage and recharge resulting in no noticeable

[29] The October 2012 Notice of Preparation of an EIR for the MPWSP describes an alternative to the MPWSP that would include a smaller desalination plant combined with the Proposed GWR Project (CPUC 2012). Based on ongoing coordination with the CPUC’s EIR consultants, this alternative is referenced as the “Variant” and includes a 6.4 mgd desalination plant that was proposed by CalAm in amended application materials, submitted in 2013 to the CPUC (CPUC, 2013).

change to groundwater levels or quality due to either project and to both projects implemented together. Therefore, the combined MPWSP (with 6.4 mgd desalination plant) and the Proposed Project would not result in a significant cumulative groundwater impact during construction.

Operational Combined Impacts on Salinas Valley Groundwater Basin

Numerous studies, and plans have documented that the impact of cumulative projects (i.e., past, present and reasonably foreseeable future projects) on the groundwater resources/conditions of the Salinas Valley Groundwater Basin are detrimental to groundwater levels and quality. These detrimental effects are considered to be a significant cumulative impact because seawater intrusion conditions in the basin have continued to worsen with time and other contamination conditions, such as high nitrate concentrations are found in numerous groundwater wells supplying drinking water to small communities (Brown and Caldwell, 2014; California Department of Water Resources, 2003; California Department of Water Resources (DWR), 2004a; California Department of Water Resources, 2015; GeoScience Support Services, Inc;, 2013; Harding ESE, 2001; Kennedy/Jenks Consultants, 2004; Monterey County Water Resources Agency, 2006; Monterey County Water Resources Agency, 2014; and State Water Resources Control Board, 2014).

As documented in the impact analyses in **Section 4.10.4.4** (under Impacts GW-3 and GW-5),the Proposed Project would have overall, net beneficial impacts on both water quality and water levels, recharge, and storage in the Salinas Valley Groundwater Basin. Accordingly, operation of the Proposed Project would not contribute to significant cumulative impacts to groundwater quality and levels in the Salinas Valley Groundwater Basin.

Operational Combined Impacts on Seaside Groundwater Basin

See the section titled "*Operational Cumulative Impacts on Seaside Groundwater Basin*" below. The cumulative conditions considered for the Overall Cumulative Projects would be the same as the combined analysis of implementation of the Proposed Project and the MWPSP with a 6.4 mgd desalination plant because all other cumulative projects are approved or mandated by the Seaside Basin Watermaster so would occur both with the combined scenario and under conditions expected with all other cumulative projects implemented. The combined impacts of the Proposed Project and the MPWSP with 6.4 mgd desalination would not result in a significant impact on groundwater levels, recharge or storage in the Seaside Groundwater Basin and the Proposed Project would not make a considerable contribution to a significant cumulative impacts on groundwater quality.

Overall Cumulative Projects

Construction Cumulative Impacts on Groundwater

While the Proposed Project would use a small amount of groundwater during construction, and would introduce small amounts of impervious surfaces, there would be no noticeable change to groundwater levels or quality due to these construction-related changes. Construction of the Proposed Project would not change groundwater quality, recharge, levels, and storage in either groundwater basin on which Proposed Project components would be located. Therefore, the Proposed Project would not contribute considerably to cumulative impacts on groundwater resources during construction.

Operational Cumulative Impacts on Salinas Valley Groundwater Basin

As documented in the impact analyses in **Section 4.10.4.4** (under Impacts GW-3 and GW-5), the Proposed Project would have overall, net beneficial impacts on both groundwater quality and groundwater levels, recharge, and storage in the Salinas Valley Groundwater Basin. Accordingly, the Proposed Project would make no contribution to adverse cumulative groundwater impacts in the Salinas Valley Groundwater Basin.

Operational Cumulative Impacts on Seaside Groundwater Basin

HydroMetrics WRI analyzed the potential for cumulative groundwater impacts related to implementation of cumulative projects in the Seaside Groundwater Basin, with and without the Proposed Project (see **Appendix M**). The analysis considers and incorporates the impacts of past, present, and reasonably foreseeable future projects that involve the Seaside Groundwater Basin, including the MPWSP with a 6.4 mgd desalination plant.

The calibrated groundwater model of the Seaside Groundwater Basin (HydroMetrics WRI, 2009) was used to estimate impacts from the cumulative projects over a 33-year modeling period, including 25 years of Proposed Project operation. The following cumulative projects and conditions were included in the modeling:

- The MPWSP with a 6.4-mgd desalination plant (also called the CalAm Facilities of the MPWSP Variant),
- implementation of Aquifer Storage and Recovery injection and extraction wells in accordance with water rights to divert from the Carmel River system and system capacity,
- ongoing imposed reductions of groundwater pumping in accordance with the requirements of the Seaside Groundwater Basin adjudication, and
- other changes to recharge and extraction assumed by the Seaside Watermaster in their ongoing modeling efforts as described in **Appendix M**.

A predictive model incorporating reasonable future hydrologic conditions was developed for this impact analysis. The groundwater model was calibrated through 2008; therefore the predictive model begins in 2009. The predictive model simulates a 33 year period: from 2009 through 2041.

Simulated future Carmel River flows were based on historical flow records. The amount of Carmel River water available for winter injection into the Seaside Basin was estimated by MPWMD staff. MPWMD compared historical daily streamflows with minimum streamflow requirements for each day, and then identified how much water could be extracted from the Carmel River for injection into the ASR wells in the Seaside Basin each month.

Cal-Am provided average monthly projections of both the groundwater injection and groundwater pumping needed to meet their anticipated future demands for their proposed Variant Project, which assumes implementation of the Proposed Project's GWR Facilities along with their MPWSP with a 6.4 mgd desalination plant. These projections were incorporated into the predictive model to the degree possible. Some modifications to Cal-Am's projections were performed to compensate for anticipated pumping capacity shortfalls in specific future years.

One additional modification to Cal-Am's projected groundwater pumping schedule was necessary to ensure adequate water would be available during a potential five-year drought. Cal-Am may need to suspend its planned groundwater repayment plan during three years of the five-year drought. This is a reasonable assumption, because all water purveyors are expected to fully use any available water supplies during a drought.

Model results show that Seaside Basin groundwater conditions (water levels, protective elevations at the coast, storage capacity, and recharge) with implementation of the cumulative projects would be the same or better than conditions without implementation of the cumulative projects. Groundwater elevations generally would be higher under the cumulative conditions than under the conditions without the cumulative projects. These higher groundwater levels would tend to slow or stop seawater intrusion. For these reasons, there would not be a significant cumulative impact on groundwater levels, recharge, or storage.

Assuming cumulative projects and required groundwater extraction changes are implemented in accordance with the Seaside Basin adjudication requirements, particle tracking was used to estimate the travel time for the proposed purified recycled water from the point of recharge to the closest point of extraction. Particle tracking showed that the shortest travel time for any recharged Proposed Project purified recycled water would be 334 days. Travel times of less than 12 months would occur for 10 years of the 25-year simulation period when the Proposed Project is in operation. With these travel times, the Proposed Project (when combined with the implementation of cumulative projects) would still be able to meet regulatory and statutory requirements established to protect human health. The analyses in **Chapter 3, Water Quality Statutory and Regulatory Compliance** and in **Section 4.10.4.4** under Impact GW-6 demonstrates that the Proposed Project would have a beneficial impact on certain water quality conditions (total dissolved solids and chloride levels), and would not degrade water quality in the basin related to other constituents. For these reasons, the Proposed Project would not make a considerable contribution to a significant cumulative impact on groundwater quality.

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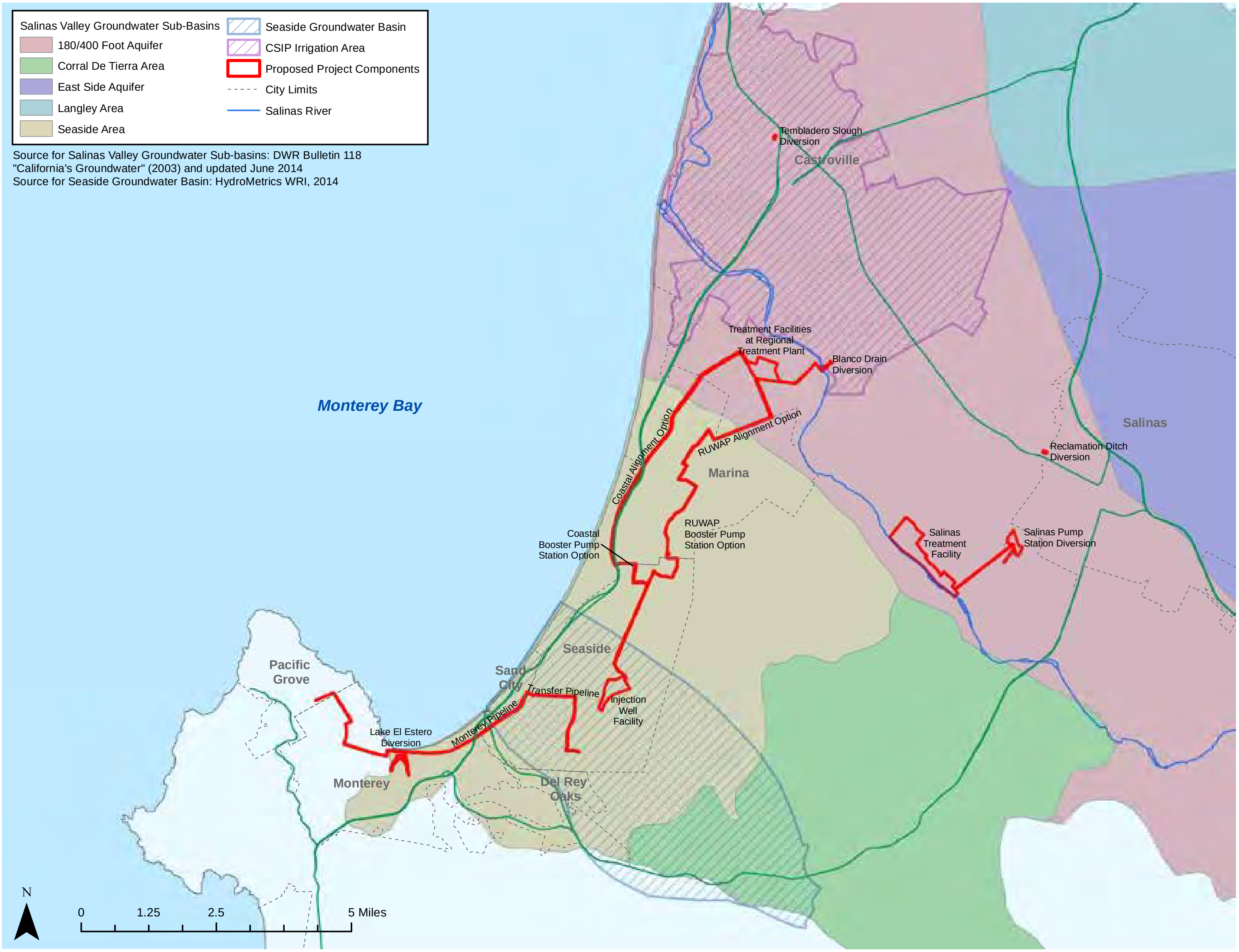
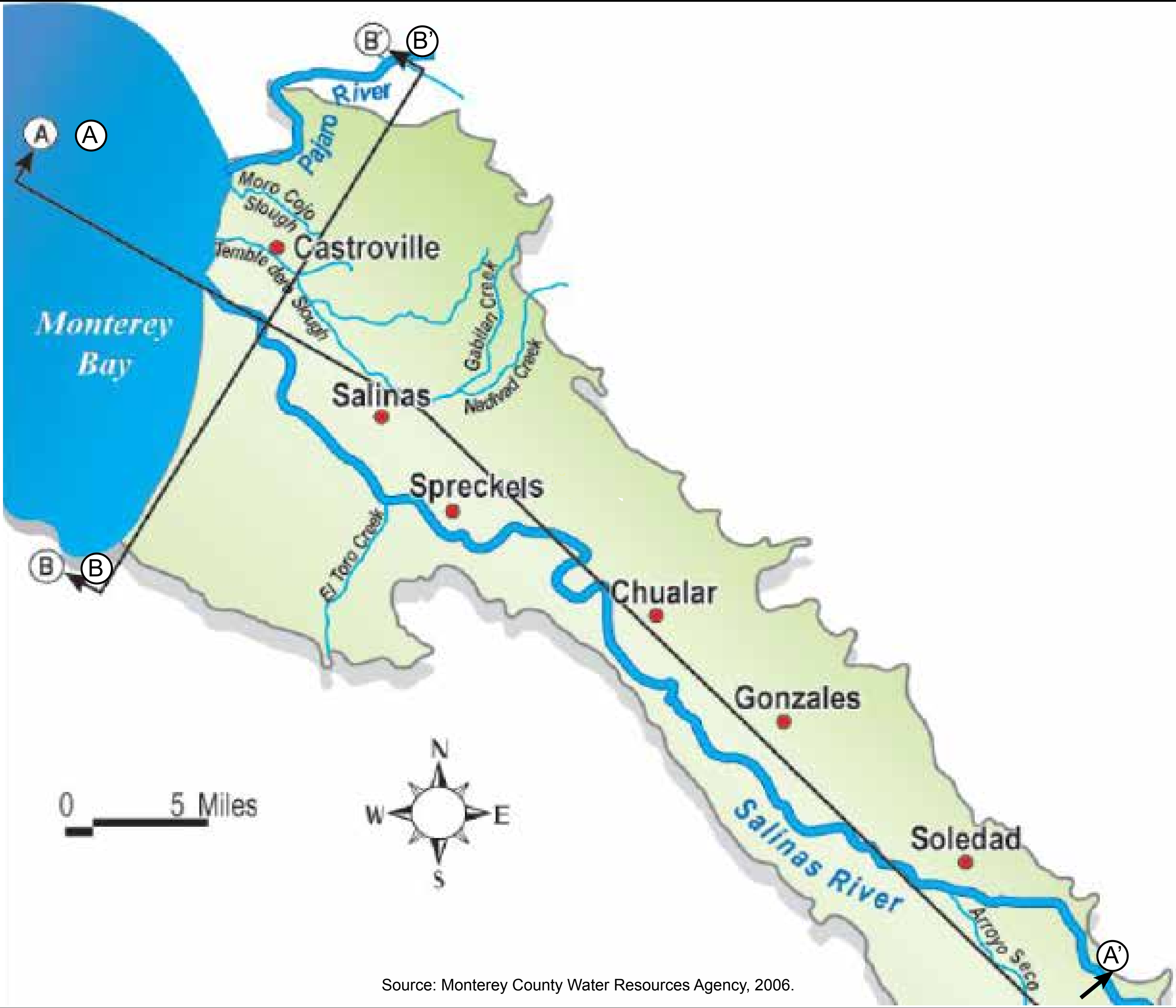


Regional Groundwater Basins and Subareas Map

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10.1



Source: Monterey County Water Resources Agency, 2006.

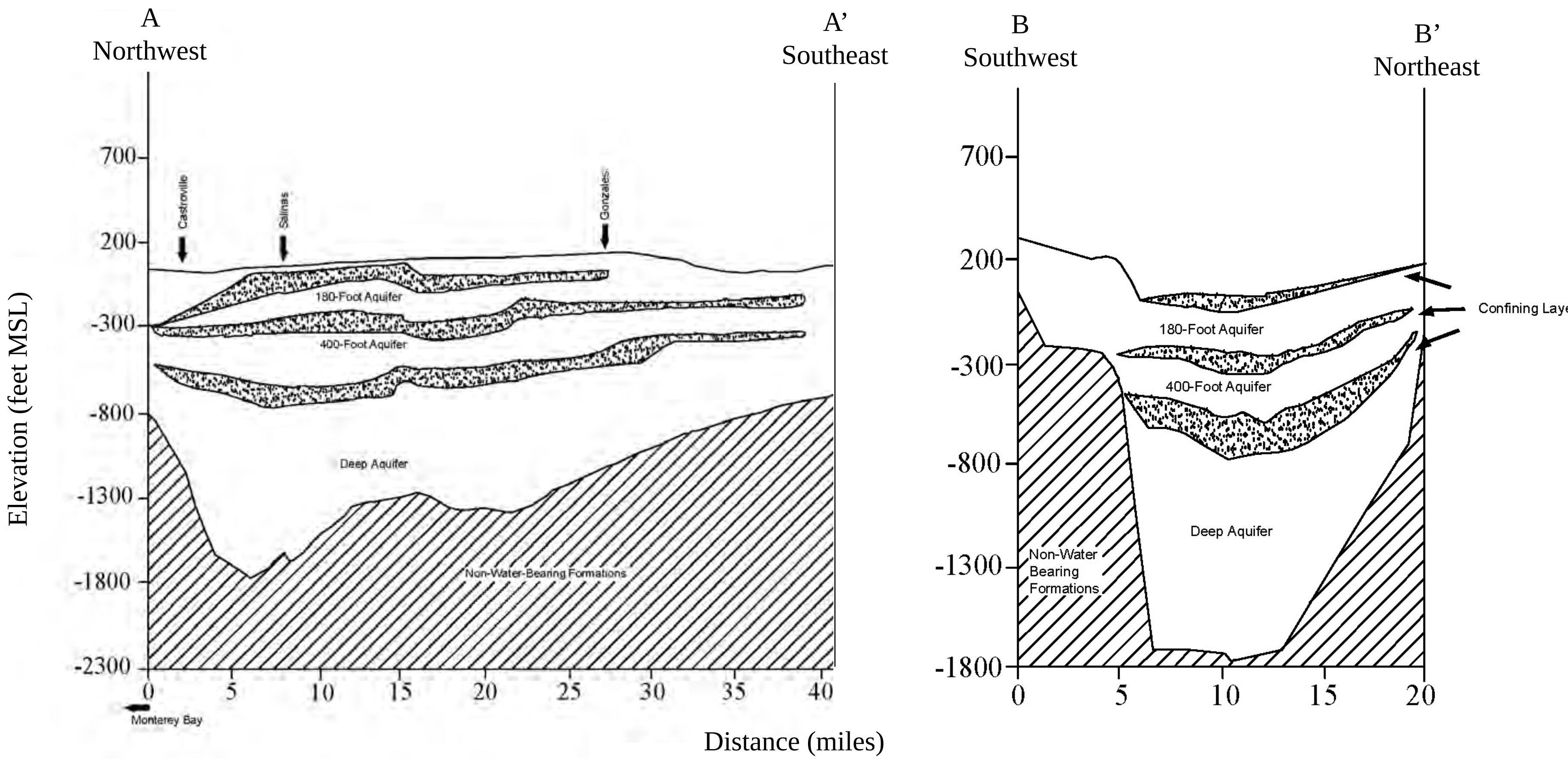
DD&A

Salinas Valley Groundwater Basin Cross-Section

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-2a



Source: Monterey County Water Resources Agency, 2006.

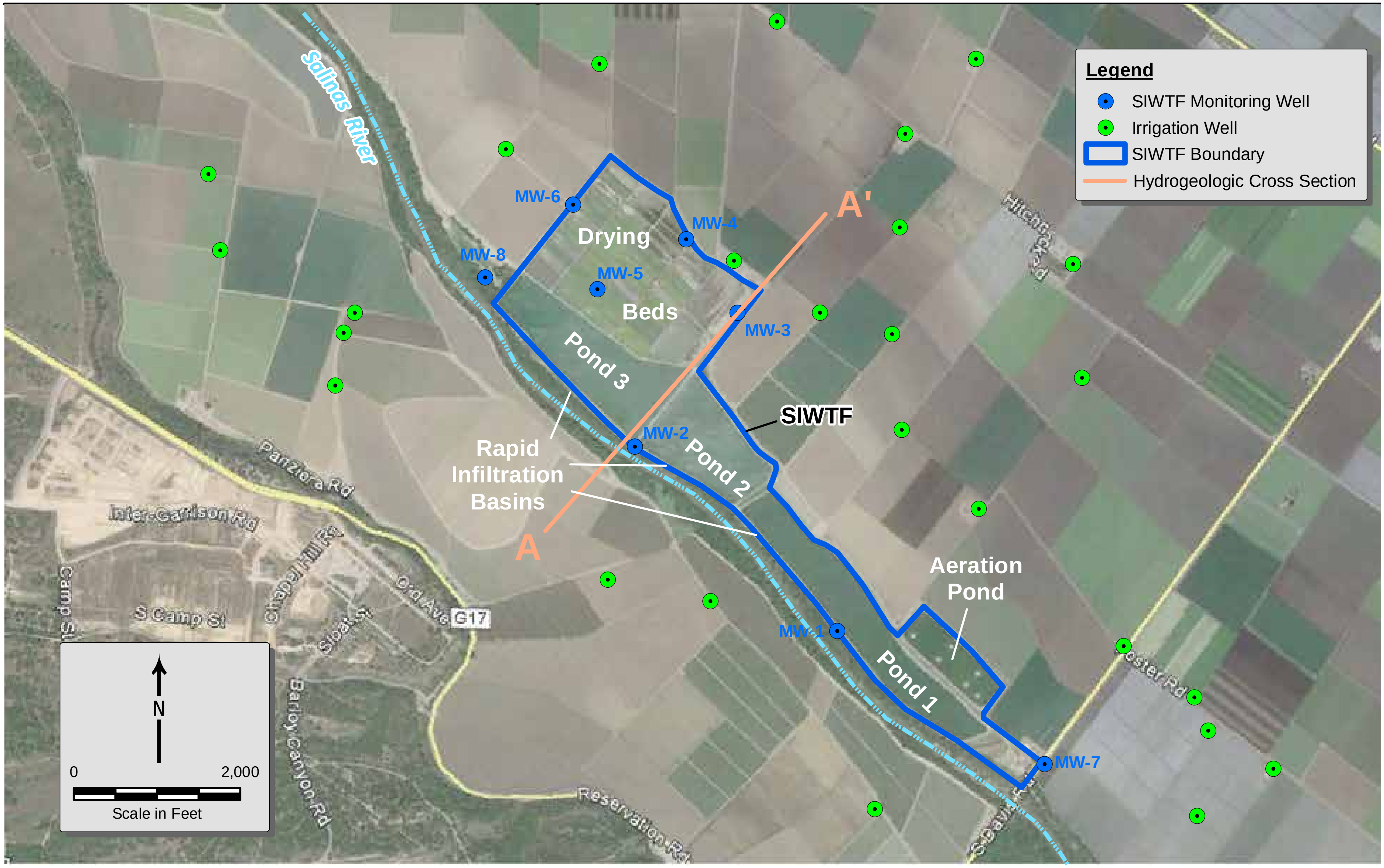
DD&A

Salinas Valley Groundwater Basin Cross-Section

March 2015

Pure Water Monterey GWR Project
Administrative Draft EIR

Figure
4.10-2b



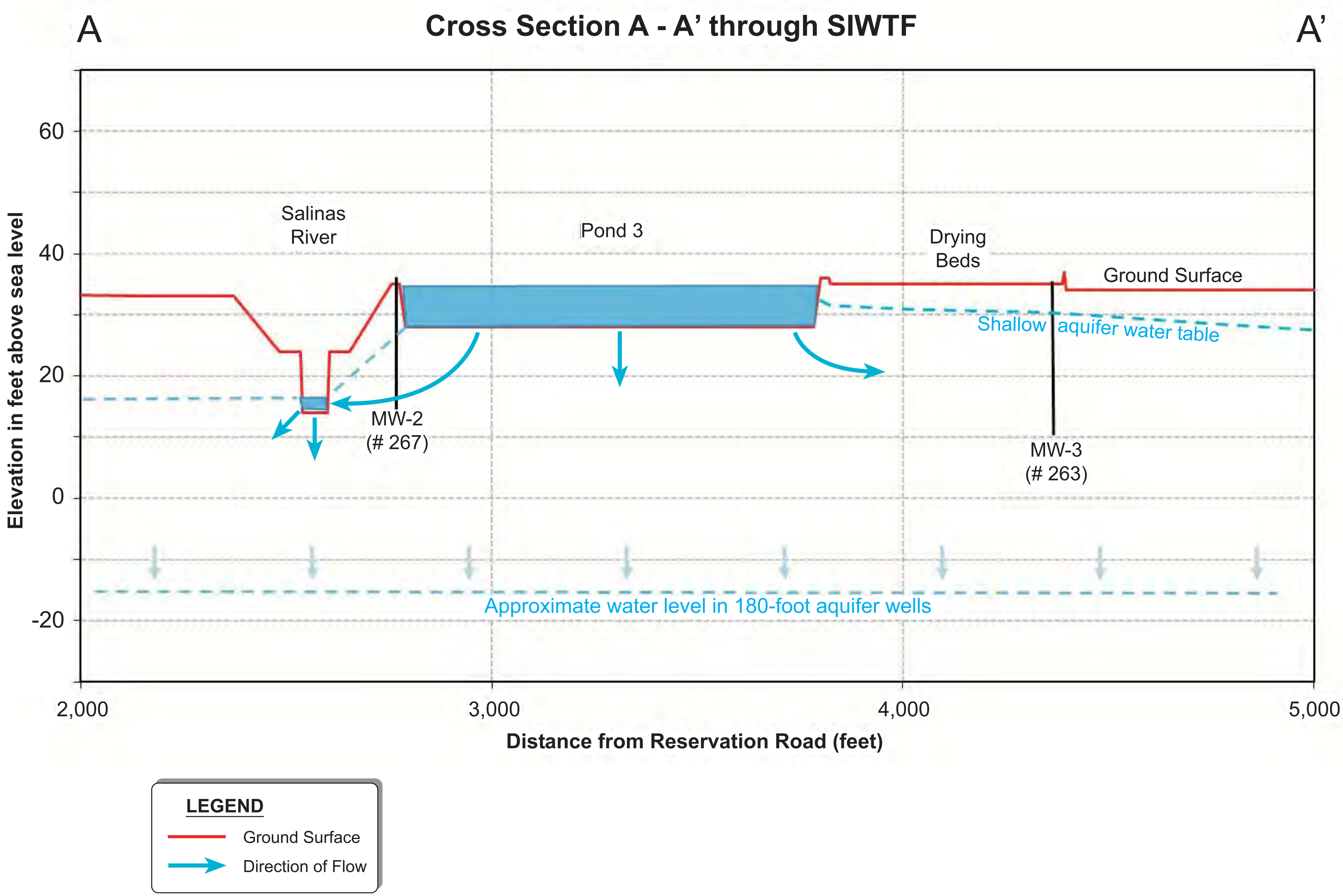
Source: Todd Groundwater, 2015c

Salinas Treatment Facility and Existing Vicinity Wells

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-3



Source: Todd Groundwater, 2015c

Hydrogeologic Cross-Section of Salinas Treatment Facility

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure 4.10-4

Source: Todd Groundwater, 2015a

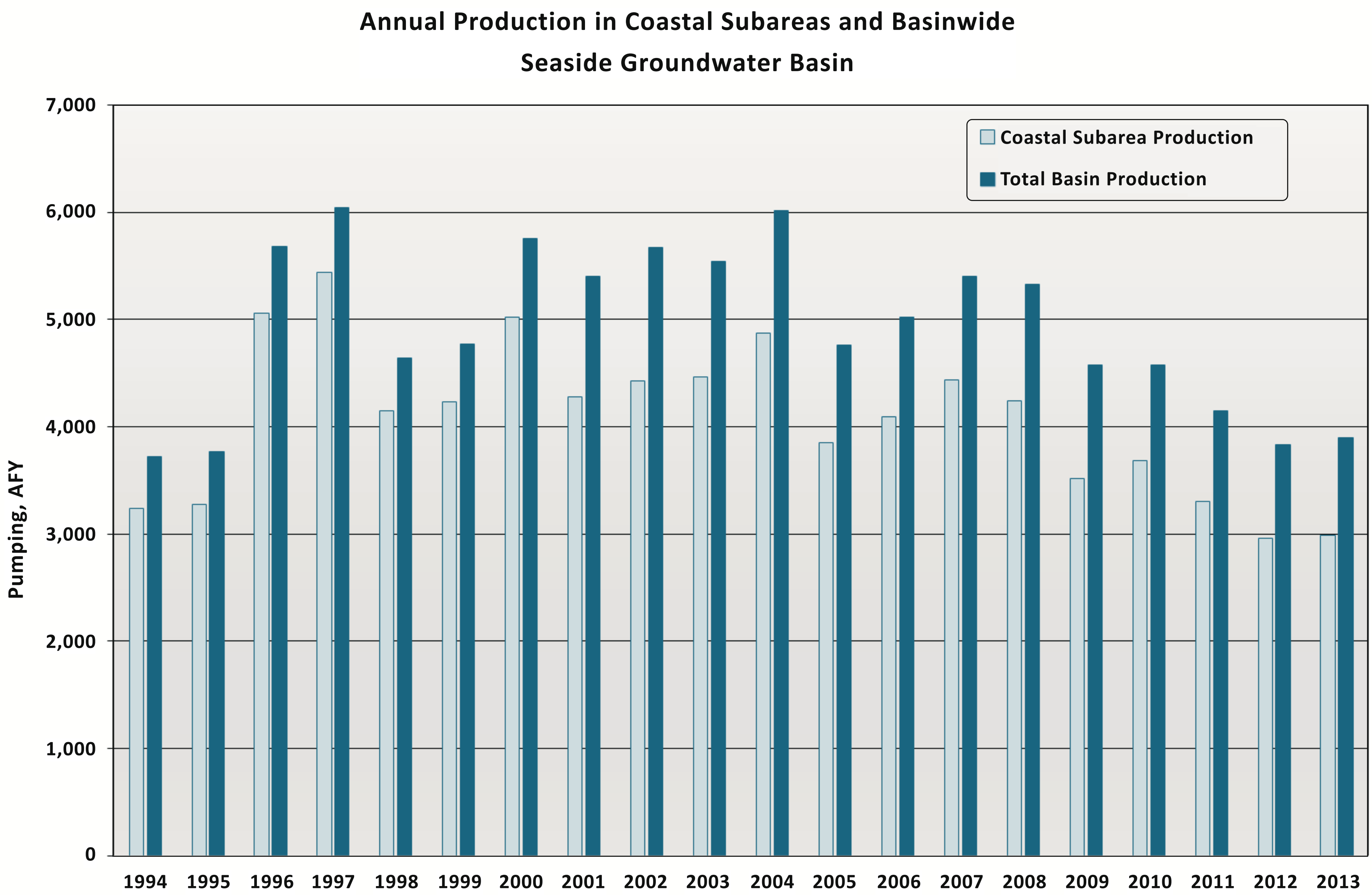
DD&A

Seaside Groundwater Basin

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-5



Notes: 1994 - 2001 data by Reporting Period (July 1- June 30). 2001 - 2013 data by Water Year (October 1 - September 30).
Pumping data do not include ASR injection or recovery amounts.

Source: Todd Groundwater, 2015a

DD&A

Coastal and Basin-wide Groundwater Production

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-6

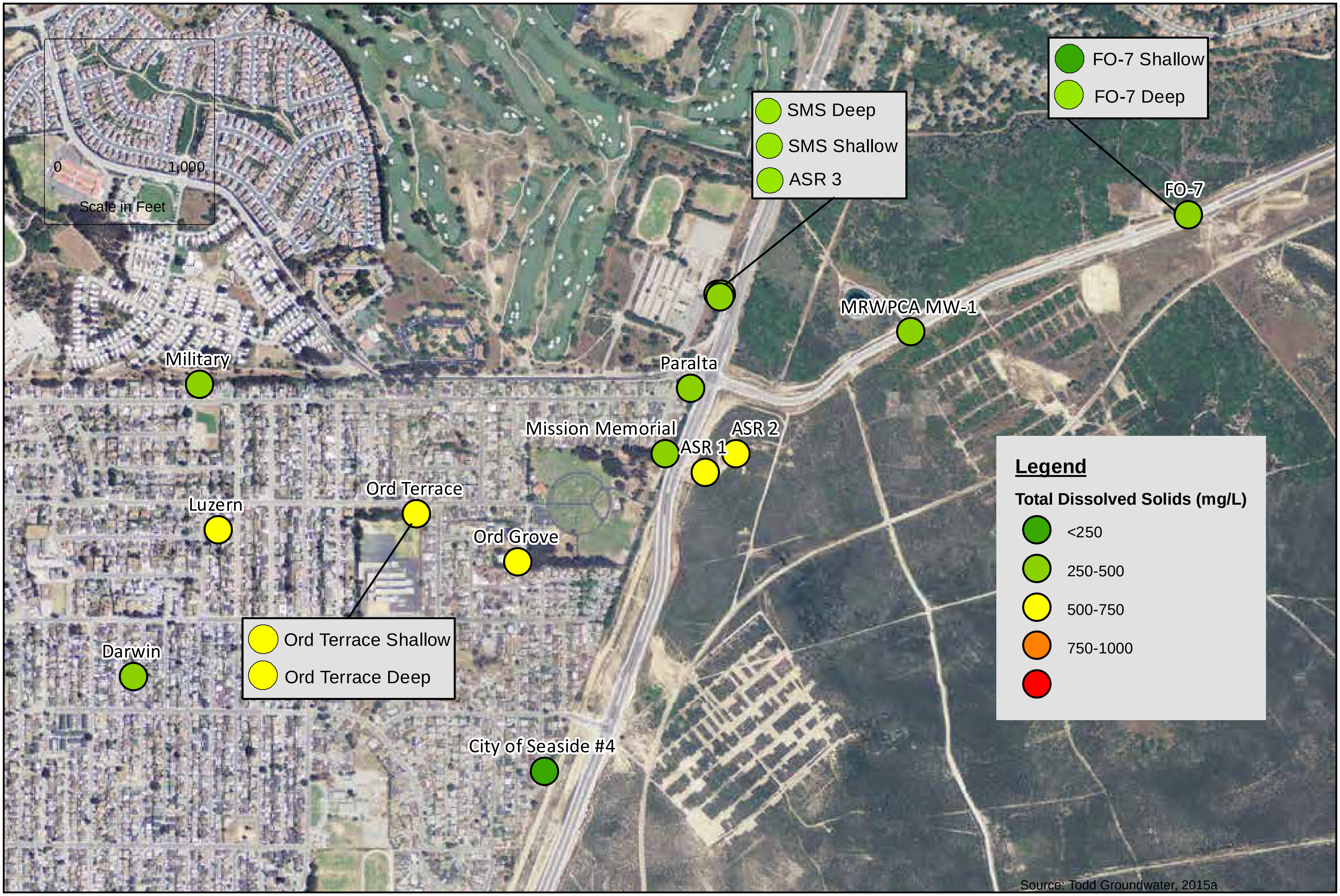
DD&A

Proposed Injection Wells and Existing Vicinity Wells

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-7



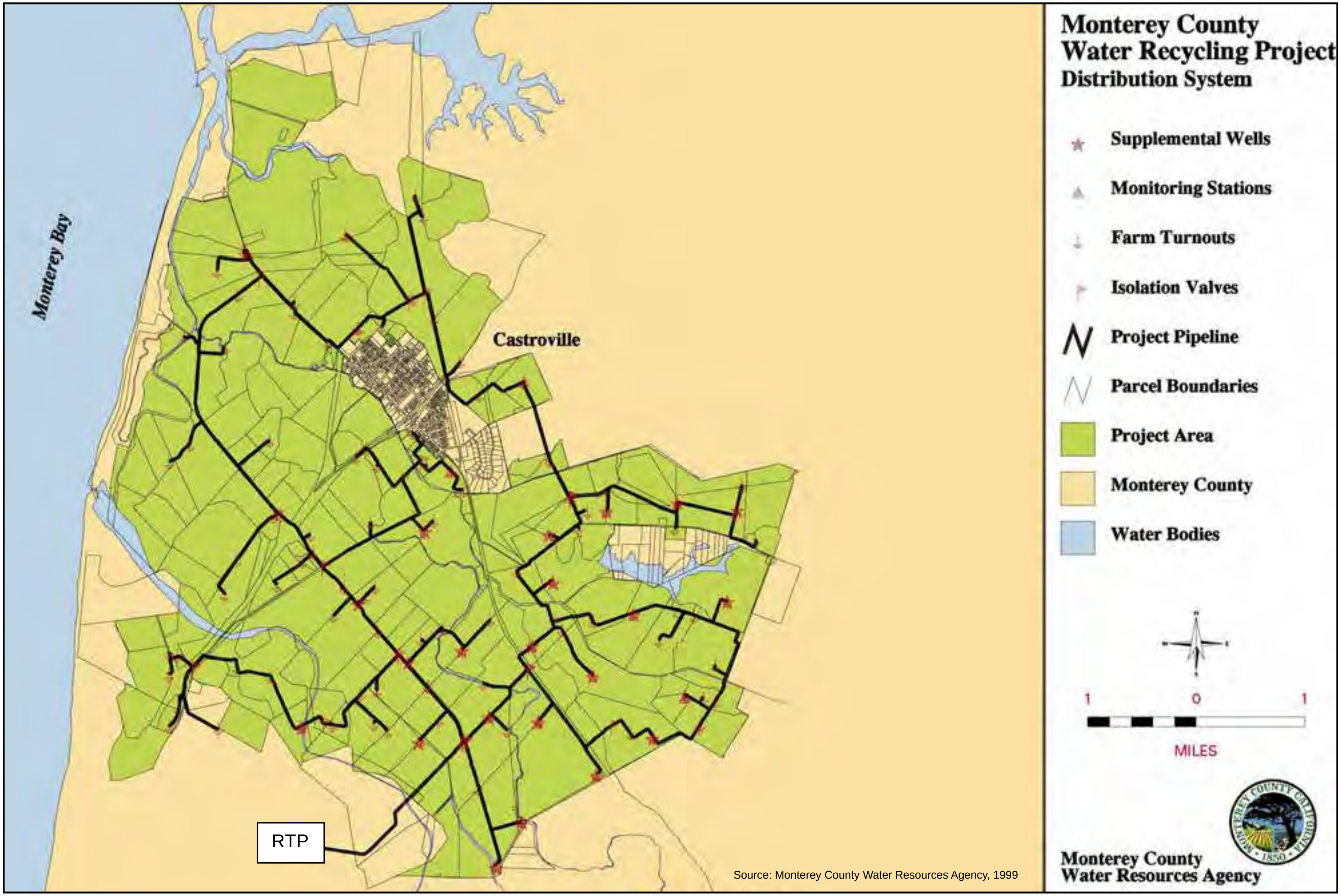
DD&A

Total Dissolved Solids in Groundwater Near Injection Well Facilities

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-8



Castroville Seawater Intrusion Project Area

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.10-9