8.5 WATER RESOURCES

8.5.1 INTRODUCTION

This section evaluates the effects of the proposed Kings River Conservation District Community Power Plant (KRCD CPP) on water resources and addresses major water resources issues related to the development of the KRCD CPP, including construction and ongoing operation and maintenance (O&M). This section describe the hydrologic setting of the project area and the chemical and physical characteristics of the water bodies that may be affected. This section also describes KRCD CPP water demands and proposed water sources to be used and discharged by the project. Both pre- and post-construction runoff and drainage patterns are also identified. Water resources issues that were evaluated in this section include runoff and drainage, water demands, water supplies, water resources impacts, and proposed mitigation measures. The laws, ordinances, regulations and standards (LORS) that are applicable to water resources are also addressed and permit requirements are identified, including applicable agency contacts.

8.5.2 AFFECTED ENVIRONMENT

8.5.2.1 Kings River Conservation District

The Kings River Conservation District (KRCD) is a subdivision of the State of California and was formed by the California Legislature with the passage of the Kings River Conservation District Act in 1951. KRCD is a multi-county special district public agency that provides resource management for the Kings River region. The KRCD service area includes agriculture, business and residential communities within 1.2 million acres in portions of Fresno, Kings and Tulare counties. KRCD boundaries encompass the entire service area of the Kings River, which is the primary source of water for the area. The mission of the KRCD is to provide flood protection, achieve a balanced and high quality water supply, and develop power resources in the Kings River region for the public good. The proposed KRCD CPP will be located within the KRCD service area.

8.5.2.2 Project Overview

The proposed KRCD CPP will consist of a nominal 565-megawatt (MW) net natural gas-fired combined-cycle base-load power plant. The power plant will be located on an approximately 32-acre site on eastern side of South Bethel Avenue between East Dinuba and East Manning avenues, near the City of Parlier, in Fresno County. The project site is located in an area with low density, rural houses. The site is also adjacent on its northern end to the Parlier Wastewater Treatment Plant (WWTP). The site is located in an area currently zoned for agriculture and currently being used predominately for agricultural purposes (vineyards). Existing structures on the project site include a vacant rural dwelling, detached garage and barn. Approximately

15 acres of a 40-acre parcel to the immediate south of the project site will be used for temporary staging and parking during construction.

Natural gas for the KRCD CPP will be provided by a new approximately 26-mile long 20-inch underground pipeline interconnection to the Southern California Gas Company (SCG) Line 7000 near the City of Visalia, California. The new gas pipeline will primarily follow existing roads and be located in public right-of-way. Five construction staging areas have also been identified for use during construction of the gas pipeline, each with an approximate size of 200 feet by 200 feet.

Electric transmission for the KRCD CPP will be provided by a new interconnection from the plant site to the Pacific Gas and Electric Company (PG&E) McCall Substation located on the west side of Leonard Avenue and north of Manning Avenue. A new approximately five mile-long 230-kilovolt (kV) radial transmission line will connect the KRCD CPP to McCall Substation. The transmission line will cross both private property and public right-of-way.

The proposed KRCD CPP will provide a base load power supply; therefore it will need a constant and reliable water source. Water demands for the KRCD CPP include 3,485 acre-feet per year (AFY) for power plant process water (cooling, boiler makeup, and maintenance) and minor demands for potable use, landscaping, and construction. Average process demands will be 290 acre-feet (AF) per month (2,190 gallons per minute (gpm)) with a peak monthly demand of 343 AF (2,590 gpm) in July. Short-term peak demands will be as high as 3,260 gpm. The primary source of process makeup water for the KRCD CPP will be recycled water delivered by new underground pipeline interconnections to the Parlier WWTP and the Sanger WWTP effluent percolation and evaporation ponds located on Lincoln Avenue (i.e., Lincoln Ponds). The Parlier WWTP is located adjacent to the north of the plant site, and the interconnection will be located at the northern plant site boundary. The proposed interconnection to the Sanger Lincoln ponds is approximately five miles north and will be located primarily along existing roadways. Currently, two options are being considered for the water pipeline interconnection to Lincoln Ponds (i.e., Water Supply Pipeline Option 1 and Option 2). Up to four new shallow wells recovering percolated effluent will provide a back-up cooling water supply.

Potable water for domestic use will be supplied by a new groundwater well to be installed on the project site. There is no offsite linear associated with the potable water supply. Domestic wastewater will be discharged to the Parlier WWTP. The sewer interconnection is located on the northern boundary of the project site with no offsite linear.

The KRCD CPP will also include a zero liquid discharge (ZLD) system that will purify and recycle process water, minimize water consumption, and eliminate process wastewater discharge. Figure 8.5-1 shows the location of the project site, the Parlier and Sanger WWTPs, effluent percolation ponds, and the proposed new pipelines/interconnections that will be constructed to deliver the effluent to the power plant.

8.5.2.3 Hydrologic Setting

This section describes the hydrologic setting at the KRCD CPP project site, Sanger and Parlier WWTPs, and in the KRCD service area. Specific topics that are discussed include: geography, climate, soils, regional geology, groundwater levels, groundwater quality, local groundwater management, surface water bodies, and water inundation zones.

Geography

The proposed project site and the Sanger and Parlier WWTPs are located in the central San Joaquin Valley near the western slope of the Sierra Nevada Mountains. Both the WWTPs include treatment facilities and percolation ponds, but only the percolation ponds are of primary interest for evaluation of this project. The percolation ponds at the Parlier WWTP are located adjacent to the treatment facilities. However, the percolation ponds for the Sanger WWTP are several miles south of the treatment facilities, and along the southside of Lincoln Avenue. The Sanger WWTP percolation ponds are referred to herein as “Lincoln Ponds”.

The KRCD CPP project site and Parlier WWTP are located adjacent to each other, just southwest of the City of Parlier, in the County of Fresno and over five miles from the Kings River in flat agricultural land at an elevation of approximately 330 feet above mean sea level (msl). The Lincoln Ponds are located approximately five miles north of the KRCD CPP project site and above the Kings River bluffs in a flat area consisting mainly of farmland, approximately 1.2 miles southwest of the Kings River at an elevation of approximately 350 feet above msl. The percolation ponds are located within the limits of the respective cities, and the proposed KRCD CPP project site is in unincorporated Fresno County. Figure 8.5-1 shows the locations of the proposed project site, WWTPs, effluent percolation ponds, and other hydrologic features in the area.

Climate

The project site and two WWTPs are located in relatively close proximity to each other and likely experience similar weather conditions. The California Department of Water Resources (CDWR) California Irrigation Management Information System (CIMIS) Station #39 near the City of Parlier is located approximately 3.7 miles east of the project site and has an active weather station that has been in operation since May 23, 1983. This is the closest active weather

station to the proposed site. The station is at an elevation of 337 feet above msl, about five to ten feet higher than the ground surface of the KRCD CPP project site. Table 8.5-1 provides precipitation and temperature data from the station based upon monthly averages for the period of 1983 to 2006.

Table 8.5-1
Summary of Temperature (in ºF) and Precipitation (in inches), Parlier, California
KRCD CPP

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Maximum Temp (ºF)	77.3	55.5	62.4	68.2	74.3	82.8	89.9	100.5	94.5	89.1	79.2	65.2	65.6
Average Minimum Temp (ºF)	48.4	37.9	40.0	43.9	47.2	53.1	58.3	62.3	60.5	55.6	47.3	39.5	35.8
Average Monthly Precipitation (inches)	1.0	2.3	2.0	2.3	1.0	0.5	0.3	0.2	0.2	0.2	0.6	1.2	1.7

Source: CIMIS, Station Parlier #39, 1983 to 2006
ºF = degrees Fahrenheit

The climate in the project area usually consists of hot arid summers with mild winters. The rainy season generally extends from November through April. Rain events will infrequently occur during other periods. Precipitation is generally low and averages about 12 inches per year.

Soils

Information on topsoils in the KRCD CPP project area was acquired from the Natural Resources Conservation Service (NRCS) Soil Survey for Fresno County. The information provided below pertains only to about the upper six feet of soil. Additional information on soil types in the project area can be found in Section 8.12, Soils.

Parlier Waste Water Treatment Plant

The majority of the soil at the Parlier WWTP consists of Hanford fine sandy loam. This soil has an erosion hazard of slight to none. This soil is also well drained, moderately coarse textured, and lacks a subsoil. While the permeability of the soil is moderately rapid, tillage compaction and vehicular traffic can easily compact the soil layers near the surface, significantly slowing the soil's infiltration rates. Where soil surface compaction is not present, the soil allows very little runoff and has a high available water holding capacity. The soils underlying the westernmost ponds at the Parlier WWTP are Hanford sandy loam. Similar to Hanford fine sandy loam, this

soil is coarse textured but has a lower available water holding capacity. No erosion hazards were noted for this soil.

Sanger Lincoln Ponds

The Lincoln Ponds area contains several types of soils. The three main percolation ponds are constructed on Hanford sandy loam, Tujunga loamy sand, and Delhi sand. As mentioned previously, Hanford sandy loam is well drained and facilitates rapid permeability, has a very low available water holding capacity, and allows very little runoff. Thus, this soil facilitates rapid water percolation. Delhi sand is also another well drained soil. Compared to Tujunga loamy sand, this soil allows even more rapid permeability, lower water holding capacity, and excessive drainage. In addition to these characteristics, the soil surface is commonly loose and incoherent, resulting in this soil having a slight hazard of blowing.

Project Site

The soil at the project site consists mainly of Hanford fine sandy loam, with the western edge consisting of Hanford sandy loam and the eastern edge consisting of Delhi Sand. These conditions are similar to the soils found at the adjacent Parlier WWTP. The Hanford sandy loam is similar to Hanford fine sandy loam described above, except that it has a slightly lower available water holding capacity. Delhi sand, however, allows very rapid permeability, has very little available water holding capacity, and has a moderate to high hazard of blowing.

In summary, based on the NRCS Soil Survey, the soils at project site and both the Sanger and Parlier effluent percolation ponds are likely very good for percolation.

Regional Geology

The KRCD CPP project site, WWTPs and percolation ponds are located within the south-central region of the San Joaquin Valley. The valley is bordered by the Coast Range mountains on the west and the Sierra Nevada mountains on the east, both of which have extensive fault networks. The valley floor has broad alluvial fans along with flood basin and marsh deposits. The San Joaquin Valley, effectively a structural trough between the two mountain ranges, includes fill consisting of Jurassic and Holocene-aged marine and continental sediments.

The WWTPs, percolation ponds, and the KRCD CPP project site are located within the King Groundwater Sub-basin, which is within the larger San Joaquin Valley Hydrologic Study Area, according to CDWR Publication 118. Figure 8.5-2 provides a groundwater basin map showing the Kings Groundwater Sub-basin and surrounding groundwater basins. The Kings Groundwater Sub-basin extends from the Sierra Nevada foothills on the east to the San Joaquin Valley trough on the west, and from the San Joaquin River on the north to roughly the Fresno County line on

the south. The Sub-basin extends beyond many political boundaries and includes other municipalities, irrigation districts, water districts, private water companies, and private users.

The Kings Groundwater Sub-basin covers an area of about 976,000 acres. The aquifers are generally quite thick in the San Joaquin Valley sub-basins with the groundwater wells commonly exceeding 1,000 feet in depth. Typical well yields in the San Joaquin Valley range from 300 gpm to 2,000 gpm with yields of 4,000 gpm possible. The smaller basins in the mountains surrounding the San Joaquin Valley have thinner aquifers and generally lower well yields averaging less than 500 gpm.

Groundwater Levels

Groundwater level data was obtained from the KRCD 2001-2003 Depth to Groundwater Report, CDWR website, and monitoring wells at the Lincoln Ponds.

Groundwater levels at the Lincoln Ponds suggest the presence of a notable mound. The groundwater below the Lincoln Ponds is approximately 30 to 40 feet higher than wells monitored by the CDWR within a mile to the north and south of the percolation ponds.

Depth to groundwater at the Parlier WWTP was estimated to be approximately 50 feet during the spring of 2003. For 2001, the groundwater levels dropped approximately five feet from spring to fall (before and after the main irrigation season). In addition, the spring average depth to groundwater increased by approximately 16 feet from 1986 to 2003, while the fall average depth to groundwater in the fall increased by 15 feet from 1986 to 2001. Presence of a mound is present at the Parlier WWTP percolation ponds is likely.

Regional average groundwater depths within Division 2 of the KRCD service territory, which includes the power plant site and two WWTPs, decreased by 3.5 feet from 2001 to 2003[1]. In addition, the spring and fall average depths increased by four and eleven feet, respectively, from 1986 to 2001.

In summary, general groundwater level trends have shown slightly decreasing groundwater levels over the past 20 years.

Groundwater Quality

In general, groundwater quality throughout the Kings Groundwater Sub-basin is suitable for most urban and agricultural uses with only local impairments. The primary constituents of concern are high total dissolved solids (TDS), nitrate, arsenic, and organic compounds.

[1] Division 2 is one of the six Divisions in the KRCD service territory.

Appendix 8.5-1 includes water quality information from monitoring wells at the Parlier WWTP effluent percolation ponds, from the existing irrigation well located on the project site and from wastewater effluent from Sanger and Parlier WWTPs.

Groundwater at most of the wells shows high levels of nitrite and nitrate, including some that exceed the maximum contaminant level (MCL), and moderate levels of TDS and electrical conductivity. This is not surprising as these conditions are common near effluent percolation ponds and are somewhat common on irrigated lands. A slight increase in the organic constituents was observed for the Parlier WWTP effluent during the summertime.

Local Groundwater Management

Groundwater management at the project site, WWTP percolation ponds and surrounding area is performed by KRCD and the Consolidated Irrigation District (CID). The KRCD performs general, regional groundwater management, while CID focuses on more local management efforts.

KRCD provides resource management for the entire Kings River Service Area and groundwater management is an important part of these efforts. The KRCD is currently involved in a variety of cooperative efforts to preserve groundwater resources. Some of these efforts include participation in the McMullin Recharge Group and the North Fork Conjunctive Management Project Group, and the monitoring of three Groundwater Management Areas.

KRCD also publishes periodic Groundwater Reports detailing water table conditions, improvements and results. These reports are used by 28 irrigation districts, 14 cities, and other interested parties that lie within the KRCD service area.

CID performs local groundwater management including groundwater level monitoring and groundwater recharge. The boundaries of CID are shown on Figure 8.5-1. The cities of Sanger and Parlier and the proposed project site are all encompassed by CID. CID is responsible for securing and distributing surface water to approximately 145,000 acres, most of which is located within Fresno County. CID's principal surface water supply comes from the Kings River and is diverted into the Consolidated Canal and distributed through a network of canals totaling approximately 500 miles in length.

Nearly all the land within CID (that is outside the cities) is used for productive farming. Farms use surface water, groundwater, or a combination of both. Annual surface water deliveries average about 150,000 AFY, and groundwater pumping averages approximately 300,000 AFY. To counteract groundwater overdraft, CID established a groundwater recharge program in the

1930's. The program consisted of purchasing land to construct recharge basins to artificially recharge the region's groundwater. As of 1999, CID owns 44 recharge basins located throughout the district, having a total area of 1,250 acres. Other means of artificial groundwater recharge within CID include using numerous privately owned basins when additional water is available and the use of 370 miles of unlined canals for incidental groundwater recharge. During a normal irrigation season, approximately 20 percent of the water diverted into the CID will flow into recharge basins.

CID regularly monitors the amount of water diverted through its canal network and delivered to groundwater recharge basins. Monthly depth to groundwater readings are also taken at 82 wells throughout the CID. Historical data has shown that the average depth to groundwater within the district has increased between 1923 and 1966, but the water table has remained fairly constant (despite annual fluctuations) since 1966. CID attempts to direct any surplus water that exceeds the demand of CID users into recharge basins for groundwater recharge.

Surface Water Bodies

The proposed project site is located in the Tulare Lake Basin along the eastern edge of the Central Valley bordering the Sierra Nevada Mountain range. The San Joaquin and Kings Rivers are the two largest sources of surface water in the area. The Kings River is about five miles east and the San Joaquin River is about 25 miles north of the proposed project site. These rivers begin high in the Sierra Nevada Mountains to the east. Their waters are stored in several large reservoirs in Madera and Fresno Counties for the purpose of sustaining beneficially used water primarily for the hot dry summer months. These waters are diverted in several locations by canals and sloughs that deliver irrigation and reclamation water throughout the upper Tulare Lake Basin.

Numerous irrigation canals and ditches are found in the area (see Figure 8.5-1). A lateral canal off the Kingsburg Branch, which is diverted from the Centerville and Kingsburg Canal, once terminated about one quarter mile from the KRCD CPP project site, but has since been abandoned.

Water Inundation Zones

The Federal Emergency Management Agency (FEMA) prepared floodplain maps of the project area, most recently updated in 2001. The project site, and both WWTPs and their percolation ponds are in FEMA Zone X, which has been determined by FEMA to be outside of the 500-year floodplain. Figure 8.5-1 shows floodplains that are located in the project area.

8.5.3 WATER RESOURCES

This section discusses the estimated water demands for the KRCD CPP, the preferred water sources, and the water supply infrastructure needed to operate the power plant.

8.5.3.1 Water Demands

Water demands for KRCD CPP operations are summarized in Table 8.5-2.

Table 8.5-2
Estimated Water Demands
KRCD CPP

Description	Water Demand
Process	3,485 AFY
Potable	2 AFY
Landscaping	1 AFY
Total	**3,488 AFY**

In addition, construction water demands are estimated to be up to 200,000 gallons per day (gpd) (0.6 acre-feet per day (AF/day)). Water for fire protection will be stored in an on-site 500,000 gallon water tank and will only be used during rare fire incidents.

Process Water

Process water demands include cooling water, boiler make-up water, and water for cleaning and other maintenance purposes. Cooling water is circulated through cooling towers to condense steam, and represents the vast majority of process water demands. Table 8.5-3 shows expected process water demands by month.

Table 8.5-3
Estimated Process Water Demands
KRCD CPP

Month	Acre-feet	Gallons per Minute	Million Gallons Per Day*
January	254	1,920	2.76
February	239	1,800	2.59
March	274	2,070	2.98
April	280	2,110	3.04
May	309	2,330	3.36
June	317	2,390	3.44
July	343	2,590	3.73
August	338	2,550	3.67
September	315	2,380	3.43

Table 8.5-3 Estimated Process Water Demands KRCD CPP			
Month	**Acre-feet**	**Gallons per Minute**	**Million Gallons Per Day***
October	300	2,260	3.25
November	261	1,970	2.84
December	255	1,920	2.76
Average	290	2,190	3.15
Total (AFY)	**3,485**	-	
* Assumes continuous operation			

The average monthly water demand is 290 AF, with seasonal demands varying by +/-18 percent from the average. The estimated water demands are based on 100 percent utilization of generation capacity. Actual plant utilization will likely be less since the power plant may not be fully utilized in some months. Periods of non-utilization will probably occur during the cooler seasons when power demands are lower.

The water demands in Table 8.5-3 represent average monthly values. Actual demands are expected to be higher according to peaking factors that account for weather variations. These will be most critical during July, which has the largest anticipated water demand. The peaking factors include the following:

- Eight percent for additional usage during a hotter than normal month (108% x 343 AF = 370 AF);
- 13 percent for daily fluctuations to account for the hottest day of a month (113% x 2,590 gpm = 2,930 gpm); and
- 26 percent for hourly fluctuations to account for the hottest hour during a month (126% x 2,590 gpm = 3,260 gpm).

Potable Water

Potable water will be needed for the power plant staff. The staff is expected to employ up to 30 full-time employees. The KRCD CPP will be operated by five shifts of three operators utilizing a 12-hour rotating shift, and one chemical technician, seven maintenance technicians, and seven administrative personnel during the standard eight-hour work day. Potable water demands are expected to be about 40,000 gallons per month. This equates to about two AFY.

Landscaping

On-site landscaping will include small areas planted with turf, shrubs and trees. It is estimated that annual landscaping water demands will be one AF with peak water demands in the summer time.

Fire Protection

Water will be stored in an on-site 500,000 gallon (about 1.5 AF) tank for fire protection. The water will be used only when needed to suppress fires on the project site.

Construction Water

During construction, water will be needed for dust control and soil moistening to achieve optimum compaction of soils. There may also be other miscellaneous water demands (washing equipment, etc.) but these will only use minor quantities of water. The maximum construction water demand is estimated to be 200,000 gpd. Concrete will be delivered by trucks from a local concrete plant so no water needs are assumed for onsite concrete mixing.

8.5.3.2 Description of Selected Water Supplies

Table 8.5-4 summarizes the proposed water supplies for process, potable, landscape, fire protection and construction water demands for the KRCD CPP. Additional water supply sources that were initially considered for meeting the various KRCD CPP water demands are discussed in detail in Chapter 9, Alternatives.

Table 8.5-4
Proposed Water Sources
KRCD CPP

Water Demand	Proposed Water Source
Process Water	Sanger and Parlier WWTP effluent. Up to four new wells recovering percolated effluent (for backup supply).
Potable	Deep groundwater (from new on-site well).
Landscaping	Existing on-site irrigation well.
Fire Protection	Deep groundwater pumping. Sanger and Parlier WWTP effluent (backup supply). On-site extraction wells (for backup supply).
Construction	Existing on-site irrigation well.

Detailed water balances are included as Figures 2-12 and 2-13 in Chapter 2, Project Description. A detailed discussion on the proposed water sources and why they were selected follows.

Process Water

The preferred source for cooling water supply for the KRCD CPP is the use of domestic effluent from the Sanger and Parlier WWTPs to be supplemented by (up to four) on-site shallow extraction wells for backup supply. The shallow extraction wells will supplement the direct effluent deliveries. This will provide redundancy in the early years of the project when effluent flows are close to power plant demands. The extraction wells will also be a backup supply in case a pipeline, pump station, or the tertiary treatment plants are down.

Waste Water Treatment Plant Effluent

Wastewater effluent is generated at the Sanger and Parlier WWTPs. This water is presently sent to percolation ponds where a small quantity evaporates and the bulk of the water percolates to the groundwater. Data on current effluent flows are available for both WWTPs. Future effluent flows can be estimated based on per capita wastewater generation and estimated population growth. Such calculations assume that per capita wastewater generation remains unchanged, which is considered a reasonable assumption.

In 2004, the population of the City of Sanger was 20,612 people. Between the years of 2000 and 2004, Sanger has experienced an annual growth rate of approximately 3.2 percent. Domestic wastewater generation is presently 80 gpd in Sanger (Carollo, 2006). The population of the City of Parlier in 2004 was 12,058 people. Giersch (2006) estimated annual population growth in Parlier to be three percent and wastewater generation at 120 gpd. Wastewater is generated from indoor water usage, which is assumed to vary little if any during different seasons. Table 8.5-5 includes historic effluent volumes and populations in 2005 and estimated annual values in five-year increments up to 2040.

Table 8.5-5
Estimated Wastewater Effluent (2005-2040)
KRCD CPP

Year	Population			Domestic Wastewater Effluent (AFY)			Average (AF per month)
	Sanger	Parlier	Total	Sanger	Parlier	Total	
2005	21,230	12,420	33,650	1,903	1,670	3,572	298
2010	24,611	14,398	39,010	2,206	1,935	4,141	345
2015	28,531	16,691	45,223	2,557	2,244	4,801	400
2020	33,076	19,350	52,426	2,964	2,601	5,565	464
2025	38,344	22,432	60,776	3,436	3,015	6,452	538
2030	44,451	26,005	70,456	3,984	3,496	7,479	623
2035	51,531	30,147	81,677	4,618	4,052	8,671	723
2040	59,739	34,949	94,688	5,354	4,697	10,051	838

* Population growth rate assumed to be three percent per year in Sanger and Parlier.

* Per capita wastewater generation assumed to be 80 gpd in Sanger based on Carollo (2006), and 120 gpd in Parlier based on Giersch (2006).

The per capita effluent flows from Sanger and Parlier differ by 50 percent (80 gpd versus 120 gpd). However, they are based on actual treatment plant flow rates and population data. They also fall within the range of typical effluent generation for similar sized cities in the region. The difference is probably attributed to Sanger having a larger number of newer homes with smaller leakage losses and more water efficient appliances and fixtures.

Comparing these numbers with the peak process demands described previously in this section, it can be seen that there will be slightly insufficient effluent to meet the peak monthly process water demands in 2010 (i.e., the year the KRCD CPP is expected to begin commercial operation).

The proposed power plant will provide a base load power supply so it will need a constant and reliable water source. Reclaimed wastewater will be available from the nearby Parlier and Sanger WWTPs on a daily basis in fairly predictable quantities. Therefore, this is an ideal water source for the power plant process water, and the majority of the process water demands will therefore be met with the wastewater effluent.

Extraction Wells

Up to four extraction wells will be installed to capture percolated effluent from the Parlier effluent percolation ponds for use as a back-up water supply. The wells will be located on the KRCD CPP project site and set back 500 feet from the Parlier WWTP percolation ponds and 500 feet from the abandoned landfill located to the east. These setbacks were recommended by the Regional Water Quality Control Board (RWQCB) to provide some additional treatment as the effluent flows through the soils (Patterson, 2006). The soil will help to improve the water quality due to soil bacterial action and filtration through intergranular flow and chemical interactions.

The Depth to Groundwater Report prepared by KRCD in 2004 provides contour maps that show groundwater flowing generally to the south and southwest from the Parlier WWTP. Thus, percolated effluent will flow directly to the proposed location of the extraction wells. Wells will not be placed at the Sanger percolation ponds because this will require a backup power supply, and could still not provide a water supply if the pipeline from the ponds to the power plant is out of service.

The number and location of wells will ultimately be determined by a detailed hydrogeological study and test hole drilling. However, at this preliminary stage it was assumed that up to four wells will be installed with long-term capacities of 650 gpm. Therefore, the total well capacity will be 650 gpm x 4 wells = 2,600 gpm, which will provide 100 percent of the average maximum

monthly water demand. The facilities will also include on-site piping and a remote Supervisory Control and Data Acquisition (SCADA) system so that pumping could be automatically adjusted to meet power plant demands. The pumped groundwater will bypass the tertiary filters since it will have received almost equivalent treatment by percolating through the soils. The groundwater, however, will be disinfected with chlorine.

Treatment Requirements

The California Code of Regulations (CCR) outlines restrictions and requirements for the use of recycled water (wastewater effluent). In particular Title 22, Section 60306 – Use of Recycled Water for Cooling, states:

> "Recycled water used for industrial or commercial cooling or air conditioning that involves the use of a cooling tower, evaporative condenser, spraying or any mechanism that creates mist shall be disinfected tertiary recycled water".

This regulation is intended to protect power plant personnel from bacteria and viruses in water mist generated at the power plant. Therefore, to be used as cooling water, the wastewater effluent must receive tertiary disinfection. The Sanger and Parlier WWTPs only treat their water to a secondary level, so construction and operation of a tertiary treatment facility on the KRCD CPP project site will be needed to use the water at the power plant.

Tertiary Treatment Plant

A new 4.2 million gallon per day (mgd) capacity tertiary treatment plant will be constructed on the project site. Secondary treated effluent will be delivered directly from the WWTPs to the new tertiary treatment plant. Constructing a single treatment plant at the project site is more economical and practical than constructing and operating a separate plant at each (Sanger and Parlier) WWTP. The quality of the treated water will satisfy all State of California Title 22 disinfected tertiary 2.3 standards, which are requirements to use the water at a thermal power plant.

Approximately 3.7 percent of the water delivered to the power plant (115,000 gpd) will be used as filter backwash water and returned to the Parlier WWTP. As a result, when using tertiary treated water, the net water demands will have to be increased by 3.7 percent. A simulation of water uses by month is included as Table 8.5-6.

Table 8.5-6
Monthly Water Supplies and Demands
KRCD CPP

	Reclaimed Wastewater Available			Water Demands			Water Supply		
Month	**Sanger WWTP**	**Parlier WWTP**	**Total**	**Power Plant**	**Tertiary Plant Backwash**	**Total Demands**	**WWTP Effluent**	**Ground-water**	**Total**
Jan	158.5	139.2	297.7	254.0	9.8	263.8	263.8	0.0	263.8
Feb	158.5	139.2	297.7	239.0	9.2	248.2	248.2	0.0	248.2
Mar	158.5	139.2	297.7	274.0	10.5	284.5	284.5	0.0	284.5
Apr	158.5	139.2	297.7	280.0	10.8	290.8	290.8	0.0	290.8
May	158.5	139.2	297.7	309.0	11.9	320.9	297.7	23.2	320.9
Jun	158.5	139.2	297.7	317.0	12.2	329.2	297.7	31.5	329.2
Jul	158.5	139.2	297.7	343.0	13.2	356.2	297.7	58.5	356.2
Aug	158.5	139.2	297.7	338.0	13.0	351.0	297.7	53.3	351.0
Sep	158.5	139.2	297.7	315.0	12.1	327.1	297.7	29.4	327.1
Oct	158.5	139.2	297.7	300.0	11.5	311.5	297.7	13.9	311.5
Nov	158.5	139.2	297.7	261.0	10.0	271.0	271.0	0.0	271.0
Dec	158.5	139.2	297.7	255.0	9.8	264.8	264.8	0.0	264.8
Total	**1902.0**	**1670.0**	**3572.0**	**3485.0**	**133.9**	**3618.9**	**3409.1**	**209.8**	**3618.9**

Notes:
1. Effluent generation is based on 2005 figures.
2. Groundwater pumping will likely decrease in future years as effluent generation increases with population growth.
3. All values are in AF.
4. 3.70 percent of water passing through the tertiary treatment plant will be backwashed.

Potable Water

The existing onsite irrigation well likely does not include an annular seal, and therefore, can not be used to supply potable water to the KRCD CPP. As a result, construction of a new well is proposed to meet the on-site potable water demands of two AFY. The quality of the shallow groundwater may be impaired due to the nearby WWTP percolation ponds, vineyard irrigation, and nearby abandoned landfill. As a result, the well will be sited at least 500 feet from the Parlier WWTP and 500 feet from the edge of the abandoned landfill to the east of the project site. In addition, the well will likely have to be drilled significantly deeper than the effluent extraction wells and will be screened and designed to extract deeper native groundwater. Based on general knowledge of the local geology, the well will probably need to be perforated between a depth of 350 and 600 feet to find water with suitable quality for potable use. Disinfection (chlorination or ozone treatment) will be provided if needed, based on bacteriological testing of the water during well installation.

Landscape Water

KRCD proposes to use the existing irrigation well to meet on-site landscape water demands. These water demands are only a fraction of the water currently supplied by the well (1 AFY versus 100 AFY). Therefore, the well will easily be able to satisfy these demands. A smaller pump will be added to the well to accommodate the smaller pumping rates.

Fire Protection Water

Potable water will be used for fire protection water. The water will be stored in a 500,000 gallon tank and delivered from the tank to meet firefighting demands when needed. The tank could also potentially be filled with other reclaimed wastewater or extraction well water should the need arise.

Construction Water

Construction water demands will be met with the on-site irrigation well. This well was found to have a maximum short-term pumping capacity of 550 gpm during a 2006 pump test. With an assumed long-term capacity of 250–550 gpm the well should be able to meet the maximum estimated demands of 200,000 gpd. Temporary water storage tanks will be provided and located on the project site to meet construction water and dust control demands. The number and size of the tanks that are used will be up to the contractor, but it is anticipated that they will use one or two 10,000 gallon tanks.

In summary, sufficient water supplies will be available from several different sources to meet KRCD CPP water demands. These sources include wastewater effluent, and deep and shallow groundwater pumping as a back-up supply.

8.5.3.3 Water Quality

Several water sources will be used for construction and O&M of the KRCD CPP and their water quality will vary during different levels of water treatment as described below.

Secondary Effluent (Process Water)

Wastewater effluent will be acquired from the Sanger and Parlier WWTPs. Appendix 8.5-1 contains recent water quality data for both effluent sources. The water quality will be altered by a tertiary treatment process to satisfy California Title 22 standards for tertiary treatment.

Tertiary Treated Wastewater Effluent

Tertiary treatment will have the following impacts on the secondary effluent: removal of most total organic carbon, total phosphorous, biochemical oxygen demand, suspended solids, and turbidity; elimination of coliforms; and a slight increase in total trihalomethanes, electrical conductivity, and TDS.

Tertiary Treatment Plant Backwash Water

When operating at full capacity, the tertiary treatment plant will create an estimated 115,000 gpd of backwash water. This backwash water will be sent to the Parlier WWTP for treatment. Compared to the secondary effluent, the TDS concentrations in the backwash water will not change, but suspended solids will increase from about 27 milligrams per liter (mg/L) to about

750 mg/L. This equates to 790 pounds of solids delivered to the Parlier WWTP daily. The delivered solids will have already passed through secondary treatment.

Disinfected Shallow Groundwater

Shallow groundwater will be pumped from wells located on the KRCD CPP project site, which is adjacent to the Parlier WWTP percolation ponds. The well locations and casing perforation intervals will be selected to collect percolated effluent and avoid fresh groundwater. As a result, the water supply will essentially be the wastewater effluent (after it has traveled a short distance through the near surface soils). The quality of the groundwater should be similar to that for the Parlier WWTP monitoring wells (see Appendix 8.5-1). Disinfection will eliminate coliforms and slightly increase trihalomethanes, electrical conductivity, and TDS.

Groundwater for Landscape Irrigation

An existing on-site irrigation well will be used to water trees, shrubs, and turf areas at the power plant. The quality of the water from a recent test is shown in Appendix 8.5-1. The water has elevated levels of nitrates, but these are nutrients beneficial to vegetation growth.

Sanitary Wastewater

Sanitary wastewater will be generated at the power plant site by power plant personnel through the use of sinks, toilets, showers, etc. It will be pumped to the Parlier WWTP for treatment. This wastewater will be no different than wastewater generated at a typical household. As a result, the Parlier WWTP will have no difficulties treating this water.

Potable Water

Shallow groundwater will be unsuitable for potable use due to high nitrogen levels. In the area, groundwater quality is known to generally improve with depth. Consequently, a deep well will be drilled to avoid the nitrogen problems. If needed, on-site treatment of the groundwater will be provided so it meets potable water standards.

Zero Liquid Discharge System Residual

The ZLD system will not create any liquid waste. All residuals from the power plant process water loop will be in solid form. The solid wastes will be trucked from the site and properly disposed of.

Seasonal groundwater-quality fluctuations are typically small in groundwater and WWTP effluent. Groundwater quality is expected to change little, if at all, during different seasons. The chemical characteristics of the secondary effluent may change slightly during different seasons since biological treatment processes are impacted by temperature. However, these changes will

generally not be reflected in the water ultimately delivered to the power plant because the tertiary treatment plant will remove most of the constituents that vary seasonally.

8.5.3.4 Water Supply Infrastructure

The water supply infrastructure proposed for the KRCD CPP will include the following:

WWTP Effluent Delivery Pipelines/Interconnections

The primary source of process water for the power plant will be reclaimed water delivered by new underground pipeline interconnections from the Parlier and Sanger WWTPs. The Parlier WWTP is located adjacent to the north of the plant site, and the interconnection will be located at the northern plant site boundary. There is no offsite linear required for the interconnection of the project site to the Parlier WWTP. The proposed interconnection to the Sanger WWTP will be at the Lincoln Ponds, approximately five miles northwest of the project site. Two optional routes are being considered and are referred to as Proposed Water Supply Pipeline – Option 1 and Option 2 as shown on Figure 8.5-1.

The pipeline to Lincoln Ponds will meet a concrete sump just west of the Parlier WWTP. Pipelines from the sump will allow water to be delivered to the power plant. Over its entire length, the pipeline to the Lincoln Ponds is expected to have a diameter of 18 inches, and will include pumping facilities capable of delivering up to 3,300 gpm to the power plant. The pipeline is designed to provide additional capacity during most of the year to facilitate exclusive use of Sanger WWTP effluent during periods where Parlier WWTP effluent is not available. This sizing is preliminary and the pipeline diameter may be increased or decreased based on economics, operational flexibility, etc. The pipeline connection between the Parlier WWTP ponds and Lincoln ponds will be primarily in public right-of-way and cross only a few privately owned parcels. This pipeline will also cross several irrigation ditches and canals**.**

Water Storage Facilities

The KRCD CPP will have on-site tanks to store water for fire protection, short-term peak demands, and a water supply interruption. Specifically, these tanks will include a recycled water holding tank (1.5 million gallons) and service/fire water tank (500,000 gallons). The volume stored for fire protection will be based on fire code requirements. Wastewater from the Sanger and Parlier WWTPs will be stored in existing storage ponds at the Parlier WWTP site and no wastewater storage facilities will be provided at the plant site. The Parlier WWTP currently has six effluent storage ponds. The storage capacity of the ponds is not known, but they cover approximately 19 acres.

Wastewater from the Sanger WWTP that is not immediately taken by pipeline to the KRCD CPP project site will be diverted to the ponding area at the Lincoln Pond. Similarly, wastewater that is not immediately taken from the Parlier WWTP ponds will remain impounded at the ponds. Should wastewater demand exceed the water available from either WWTP, then water that is ponded at either site can be used to make-up the difference. The 1.5 million gallon recycled water holding tank will allow for some fluctuation in operations between the plant demand and wastewater availability.

Stormwater Basins

A basin will be constructed on the project site to retain stormwater on-site from the two-year 24 hour storm. The basin will cover approximately one acre and be four to five feet deep.

Sewer Interconnection

Sanitary waste will be generated from the power plant staff through the use of sinks, toilets, showers, etc. The sanitary waste will be discharged to the Parlier WWTP, which is conveniently located immediately north of the power plant. The KRCD CPP sewer interconnection is located at the northern project site boundary and no offsite linear facility is required to discharge the wastewater to the Parlier WWTP. These domestic wastewater flows will average about 40,000 gpm, which could be easily accommodated by the two mgd capacity Parlier WWTP. Provisions of this service are provided in a will-serve letter which is included in Appendix 6-2 to Chapter 6, Water Supply.

Extraction Wells

Up to four new extraction wells will be installed at the project site to extract percolated effluent from the Parlier WWTP percolation ponds and to provide the KRCD CPP with a back-up cooling supply.

Monitoring Wells

Monitoring wells will be needed to evaluate the groundwater level impacts from reducing deliveries to the WWTP percolation ponds. Numerous monitoring wells are already in use at the Sanger and Parlier percolation ponds, and will be used with the cities' permission. The proposed extraction wells could also be used to monitor groundwater levels. They will only be used occasionally for backup supplies and to help meet peak demands, so the groundwater levels in the wells will normally reflect static conditions. Lastly, some nearby landowners may grant KRCD permission to monitor groundwater levels in their private wells. As a result, it is not anticipated that new monitoring wells will need to be constructed.

Backup Power Supply

During periods of electrical generation, the power plant uses its generated power for plant electrical loads including operation of the tertiary treatment plant. When the plant is not dispatched and is not generating power, the plant receives electricity from the transmission system. During an outage involving the transmission system, the plant is unable to generate electricity for delivery and process water demands drop to a negligible level. In this case, water is not required as minor demands can easily be accommodated with process water stored in tankage and the tertiary treatment system is not required. During an outage involving the local distribution system (which will cause local area customers to lose power), the tertiary treatment plant will be unaffected as the plant received no electrical power from this source.

Backup generators for the wells and tertiary treatment plant are not proposed or deemed necessary. Pumps will be installed to deliver water via a pipeline from the Sanger WWTP to the power plant. The pumps will not be connected to this backup generator and could be down during a power outage.

Backup Water Supply

The proposed water supply plan discussed above includes sufficient redundancy to ensure an adequate water supply if Sanger WWTP effluent cannot be delivered. This redundancy includes extraction wells, which can provide 100 percent of the power plant water demands, and storage ponds at the Parlier WWTP, which will store up to ten days of water demands.

Tertiary Treatment Plant

The tertiary treatment plant will be a single facility located at the power plant site and capable of treating 4.2 mgd. Secondary treated effluent will be delivered directly from the WWTPs or Parlier storage ponds to the new tertiary treatment plant. Constructing a single treatment plant at the power plant site will be more economical and practical than constructing a separate plant at each (Sanger and Parlier) WWTP. Figure 8.5-3 provides a schematic of the tertiary treatment plant layout.

Water entering the new treatment facility will initially pass through disk filters designed to remove turbidity from the secondary effluent. Two turbidimeters (turbidity meters) will be provided, one on the filter influent line, and one on the filter effluent. Any time the filter influent flow exceeds five nephelometric turbidity units (NTU) or the filter effluent flow exceeds two NTU, polymer from an on-site storage tank will be added at an injection point upstream of the filters. Between normal filter cycles, each of the cloth filter disks will be backwashed using filtered water; the backwash water will be pumped back to the Parlier WWTP for reprocessing.

Filter effluent will then flow by gravity to a chlorine contact tank, after being injected with sodium hypochlorite solution. Sodium hypochlorite will be stored in solution on-site in a chemical storage tank, and pumped to the injection point by means of a chemical metering pump. The contact tank will contain baffle walls to induce a serpentine flow through the tank, thus providing sufficient contact time for disinfection. Two vertical turbine pumps located at the downstream end of the contact tank will then pump the filtered treated water to the power plant.

Redundancy will be provided throughout the tertiary treatment plant. Four filters will be provided (three on-line and one standby), with sufficient capacity to filter the design flow with one unit out of service. A second chemical metering pump will also be provided for redundancy in the chlorine dosing. The chlorine contact tank will include a center wall dividing the contact tank in half with each half of the contact tank designed for the complete 4.2 mgd flow. Two vertical turbine pumps will be provided at the end of the contact tank, each also having capacity to pump the entire flow.

The tertiary treatment facility will remove some volume of solids in the filtering process. An estimate of the volume of solids removed can be approximated with a manufacturer's assumption that, based on experience, 3.7 percent of flow through the filters will become backwash water. Using this assumption, the treatment of 3,485 AF annually will generate about 115,000 gpd of backwash water. On-site processing of the filter backwash water will be very expensive; as a result, the backwash water will be returned to the Parlier WWTP and treated as ordinary wastewater.

8.5.4 RUNOFF AND DRAINAGE

This section analyzes potential effects on runoff, drainage, erosion, and sedimentation that could result from the construction and O&M of the KRCD CPP.

8.5.4.1 Flooding Potential

In 2001, the FEMA mapped the area of the proposed power plant as being outside of the 100- and 500-year flood hazard zones, as shown on Figure 8.5-1. The nearest areas with concerns of flooding, as established by FEMA, are along the Kings River and isolated areas within the City of Parlier. These designated floodplains are several miles from the proposed project site.

The KRCD CPP will not involve the construction or modification of any significant dams or levees; therefore, the KRCD CPP will not expose people or structures to significant risk or loss, injury or death resulting from a levee or dam failure. Similarly, the project is located over 100 miles from the Pacific Ocean and any potential inundation from tsunami is remote. The

project is not located near any large water bodies, hills or mountains, so there is no potential hazard from seiche or mudflows.

8.5.4.2 Potential for Wind or Water Erosion and Sedimentation

During KRCD CPP construction, approximately 30 acres of land on the project site and 15 acres of land on the adjacent construction staging area will be cleared of crops (vineyards), graded and leveled. The proposed power plant site contains a topsoil consisting of Hanford fine sandy loam, Hanford sandy loam and Delhi sand. According to the NRCS Soil Survey, the Hanford fine sand loam and sandy loam have a slight to no erosion hazard, but the Delhi sand has a high blowing hazard. The site has very little slope and experiences little rainfall, but winds can be moderate to high at times. The greatest potential for wind or water erosion and sedimentation will occur during construction. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared to address these issues (see below). In addition, landscaping will be constructed throughout the power plant site and will reduce soil erosion on the exposed soil surfaces. Furthermore, the already shallow slopes on the site will be leveled, further reducing the threat of runoff and erosion.

8.5.4.3 Existing Drainage Characteristics

As discussed previously in this section, the project site is characterized by low precipitation, relatively flat slopes, and an absence of floodplains. Therefore, on-site runoff and drainage are not major issues, but they still need to be addressed. In general the slopes on the property are mild. Based on a visual observation of a topographic survey the slopes appear to be three feet/1,000 feet. There are no significant water features in the area and runoff is characterized as sheet flow. The sheet flow will ultimately, under very large storms, flow to Fresno Slough. A preliminary topographic survey revealed that there is a low area traveling north-south in the middle of the power plant site. The survey also suggests that surface water from the western two-thirds of the property will drain to the south and southeast, and the surface water from the eastern one-third of the property will drain to the northwest. These areas will be leveled for the power plant construction and runoff will be directed to on-site stormwater retention basins.

8.5.4.4 On-Site Drainage Facilities

Development of the KRCD CPP will increase the area of impervious surfaces, and some on-site drainage facilities will be necessary. Runoff will be directed through channels and drain pipes to a stormwater basin. The project is located in unincorporated Fresno County. As a result, drainage design is governed by the Fresno County Improvement Standards prepared in October 1966 (See Appendix 8.5-2). The standards require that drainage facilities be designed for the five-year 60-minute storm using the Rational Method. Due to the simplistic nature of the Fresno County Standards, the drainage facilities will be designed to another more rigorous

method that will provide at least the same level of protection. A preliminary design of drainage facilities was performed using the NRCS TR-55 method. A two-year 24-hour storm was selected, as this is often the preferred minimum storm. This results in 1.5 inches of rainfall in 24 hours. This will equate to about 3.8 AF of runoff. The proposed stormwater basin will cover about one acre and be four to five feet deep, and will be able to accommodate the expected discharge. This volume is significantly higher than the volume that will be generated from a five-year 60-minute storm (Appendix 8.5-2, Fresno County standards). Drainage pipelines and ditches have not been individually located or sized, but they will, as a minimum, conform with the Fresno County Improvement Standards.

8.5.4.5 Oil-Water Separator

Miscellaneous general plant drainage will consist of cleanup, sample drainage, equipment leakage, and drainage from facility containment areas. Water from these areas will be collected in systems of floor drains, sumps, and pipes within the facility and discharged to an oil/water separator. In addition, power plant equipment areas such as lube oil storage areas and chemical storage areas will be provided with secondary containment to prevent contaminated storm water from exiting the site. Processed contact stormwater (from the oil-water separator) will be recycled for use as cooling water and the residual solid waste will be disposed of in an appropriate off-site landfill.

8.5.4.6 Construction Storm Water Pollution Prevention Plan

A SWPPP is required by the State of California to obtain a General Construction Permit for any project that will disturb one or more acres of soil, or for projects that will disturb less than one acre of soil but are part of a larger common plan of development that will disturb a total of one acre or more. Such construction activity that is subject to the SWPPP requirement includes clearing, grading, and disturbances to the ground such as stockpiling or excavation. The proposed KRCD CPP will include these construction activities and permanent disturbance of about 25 acres for the power plant construction, and temporary disturbance of 15 acres for a construction lay-down area. As a result, a construction SWPPP will be required.

The purpose of a SWPPP is to identify potential pollutant sources that may affect the quality of discharges associated with construction activity, to identify non-storm water discharges, and to design the use and placement of Best Management Practices (BMPs) to effectively prohibit the entry of pollutants from the construction site into the storm drain system. Erosion and sediment source control BMPs must be considered for both active and inactive (previously disturbed) construction areas. BMPs for wind erosion and dust control are also included. The SWPPP will also include a revegetation plan for the temporary construction laydown area. The SWPPP will likely require modifications as the project progresses and as conditions warrant and will include

BMPs that will reduce the potential for flooding, erosion and sedimentation to a level of insignificance. A draft outline for the construction SWPPP is included as Appendix 8.5-3.

8.5.4.7 Construction Sedimentation and Erosion Control Plan

Construction Sedimentation and Erosion Control Plans are sometimes prepared for projects, particularly if erosion is a large concern, such as in areas with high relief, erodible soils, heavy rainfall, and discharge to local streams and rivers. Potential for erosion on the project site is only a moderate concern due to the relatively flat slopes and low rainfall in the area. As a result, a separate Construction Sedimentation and Erosion Control Plan will not be prepared, rather appropriate issues will be addressed in the SWPPP (Section 500 in the SWPPP outline found in Appendix 8.5-3).

8.5.5 ENVIRONMENTAL CONSEQUENCES

This section discusses the anticipated project impacts on water resources, and proposed efforts to mitigate any negative impacts. The construction and O&M of the KRCD CPP will result in both positive and negative impacts to the local water resources.

8.5.5.1 Regional Water Impacts

The KRCD CPP will cause a reduction in existing groundwater recharge efforts by about 3,500 AFY. At the same time, the approximately 100 AFY of crop demands on the project site will be eliminated, so the net impact on groundwater recharge will be about 3,400 AFY.

The RWQCB has encouraged agencies to make greater use of reclaimed water. Use of the reclaimed water at the power plant promotes the public's interest in putting recycled water to the maximum reasonable and beneficial use, pursuant to Water Code Section 13500 et seq.

The KRCD CPP project site is located in the 145,000-acre CID. The CID presently pumps an estimated 300,000 AF of groundwater each year. Therefore, the reduced recharge of 3,400 AF will be minor compared to CID's total groundwater usage

8.5.5.2 Groundwater Level Impacts

In April 2007, Water Resources and Information Management Engineering, Inc prepared a memorandum entitled "*Parlier Power Plant Groundwater Impact Analysis*" (see Appendix 8.5-4). The memorandum estimates groundwater level impacts from the proposed power plant. The analysis was performed using the Kings Basin Integrated Groundwater Surface Water Model (Kings IGSM). The Kings IGSM is a comprehensive, regional hydrologic model that simulates both surface water and groundwater flow systems in the Kings Groundwater Basin. The model was developed under direction and with input from the Upper Kings Basin Water Forum.

Important hydrogeologic parameters in the model included transmissivity, which ranged from 14,000 to 60,000 cubic feet per day (ft^2/day), and specific yield, which ranged from 0.06 to 0.15.

The results of the model show that the reduced groundwater recharge at the percolation ponds and groundwater pumping at the power plant site will cause a reduction in groundwater levels up to five feet in localized areas. These impacts are not considered significant for the following reasons:

1. The model simulated a worst case condition, and actual groundwater level declines will likely be less. Firstly, the model assumed that the power plant would operate 100 percent of the time for 40 years. In reality, the power plant will occasionally be down due to maintenance or low power demands in the winter. In addition, the analysis does not consider that local groundwater pumping will be reduced by about 100 AFY due to the planned removal of vineyards at the power plant site.
2. Figures 8.5-4 and 8.5-5 show that about 15 wells are located within one-half mile of the Sanger and Parlier percolation ponds. However, the greatest groundwater level declines are predicted to occur at the power plant site and WWTP properties, with lesser declines on neighboring properties. The WWTPs would not be adversely impacted by a groundwater level decline.
3. A decline in groundwater levels beneath the WWTP percolation ponds may be beneficial in the future. Continuous recharge of effluent for many years has created a slight increase in groundwater levels near the ponds. Mounding is evident at the Lincoln Ponds based on recent groundwater contours. Insufficient groundwater level data is available to determine the presence of mounding at the Parlier WWTP. However, given the large volume of water that is percolated each year (1,700 AF over 30 acres of percolation ponds), the presence of a mound is considered likely. Groundwater levels at the Parlier and Sanger percolation ponds are about 30-feet deep. Farmers typically become concerned when groundwater levels rise to about ten feet from the ground surface as they pose a risk to waterlogging the root zone and damaging crops. As a result, the mounding is not presently a concern. Nevertheless, as effluent generation increases, localized mounding may become an issue. By taking the majority of the effluent for use at the power plant, KRCD may help to avert or delay future mounding problems.
4. The model was run using 1964 to 2004 hydrologic records to represent likely future conditions. Figures 6 to 8 in Appendix 8.5-4 shows that climatic fluctuations in groundwater levels can be greater than 40-feet during wet and dry periods. These natural fluctuations are much higher than the predicted changes from the power plant operations.

5. Neighboring properties may currently be benefiting from the artificially high groundwater levels created by the mounds. The impact from the reduced recharge will not be a cone of depression, but rather only a partial flattening of these mounds. Effluent use will increase as the population grows, but the power plant use will remain constant. Therefore, although the mound will initially flatten, it will eventually return to current conditions.

In summary, reduced groundwater recharge at the percolation ponds and minor groundwater pumping at the power plant site are not expected to cause significant impacts to the local groundwater levels.

8.5.5.3 Groundwater Quality Impact

The Water Quality Control Plan for the Tulare Lake Basin (Basin Plan) was adopted by the RWQCB in 1975 and updated in 1995. The Basin Plan sets water quality objectives for the Tulare Lake groundwater basin. The Basin Plan discusses the deterioration of groundwater quality in the area due to increasing salt levels. The Basin Plan also recognizes that it is not practical to halt the rise in groundwater salinity, but has set goals for maximum increases in salinity. As with most valley communities, the effluent from the Parlier and Sanger WWTPs has elevated levels of dissolved salts. These salts are presently dispersed in the groundwater when effluent is percolated. By diverting effluent to the power plant, these salts will no longer be added to the groundwater, but will instead be removed and disposed at permitted landfills.

The KRCD CPP will operate with a ZLD system for cooling and process water. This process will continuously remove dilute salt from the cooling water circulation system, and will further concentrate and dewater those salts for disposal as a solid. As a result, the power plant will produce salts only in solid form, with no process water blowdown (i.e., zero liquid discharge). The salts removed will be hauled off site to a licensed disposal facility. This will result in the direct and permanent removal of salts from the groundwater basin. This situation is a tremendous benefit to the local groundwater quality as the permanent removal of salts from the groundwater basin is uncommon. Assuming the effluent has a TDS of 350 mg/l and the power plant is operated at an equivalent availability factor of 90 percent, then approximately 1,650 tons of salts will be exported from the groundwater basin annually.

Future effluent flows will exceed the power plant demand, and percolation of effluent will resume at increasing rates as service population grows in the two communities. Future groundwater degradation from this percolation will be reduced due to reduced mounding of effluent under the percolation ponds, providing a deeper soil profile for the effluent before entering the aquifer. The reduced mounding will be a minor improvement in future groundwater quality due to the deeper soil profile available to ‘filter’ effluent during percolation at the ponds.

8.5.5.4 Flooding and Inundation Impacts

Construction and O&M of the proposed KRCD CPP will not adversely impact flooding, drainage, erosion, or sedimentation. Development of the KRCD CPP will cause an increase in impervious area and hence increase runoff during rainfall events. However, the design will include adequate drainage and stormwater retention facilities to accommodate the runoff from a two-year 24-hour storm. The stormwater retention facilities will keep all runoff on-site until it either evaporates or infiltrates. The KRCD CPP will have no offsite discharges to surface water and, therefore, will not violate water quality standards or waste discharge requirements nor degrade surface water quality.

A Storm Water Permit for Construction Activity and Storm Water Permit for Industrial Activity will be obtained from the Central Valley RWQCB. These permits each require the development and implementation of a SWPPP. The SWPPPs will include BMPs to limit flooding, erosion, and sedimentation to levels of insignificance at the power plant site and temporary construction laydown area. An outline of the draft SWPPP is included as Appendix 8.5-3. Preconstruction, construction and post-construction drainage plans are included as Appendix 8.5-5.

8.5.5.5 Cumulative Impacts

Cumulative water resources impacts from the KRCD CPP are not anticipated to be significant. The effluent water will improve groundwater quality through the permanent removal of salts from the groundwater basin. Groundwater levels are expected to decline, but these declines are not considered significant. Moreover, this groundwater level decline will be coupled with the aforementioned improvement in groundwater quality resulting in what could be considered a net improvement to the local groundwater resources.

8.5.5.6 Mitigation Measures

As discussed in this section, impacts are minor and some impacts have positive effects, so no mitigation is proposed. To ensure the KRCD CPP will not cause erosion or degrade water resources due to releases of stormwater, the project will operated under an approved SWPPP and will use appropriate BMPs during construction and O&M.

8.5.6 LAWS, ORDINANCES, REGULATIONS AND STANDARDS

Water resource related federal, state, county, and local LORS which are applicable to the KRCD CPP are discussed below and are summarized below in Table 8.5-7.

Table 8.5-7 Water Resources LORS KRCD CPP		
Regulation/Program	**Description**	**Project Applicability/ AFC Section Reference**
Federal		
Clean Water Act (CWA) Section 402 California Water Code Section 13000 et. seq.,	Prohibits discharges of pollutants into receiving waters unless the discharge is in compliance with a National Pollution Discharge Elimination System (NPDES) permit. Applies to all point-source discharges, including industrial wastewater and stormwater runoff, during both construction and operation. Program is implemented by the RWQCB.	The KRCD CPP will obtain applicable NPDES permits for construction and industrial stormwater prior to construction and operation. See Section 8.5.4.6 and Section 8.5.6.2.
State		
Central Valley RWQCB- General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (NPDES Permit No. CAS000002),	A General Construction Permit is required for all construction activities that involve more than five acres of land disturbance.	The KRCD CPP will obtain a General Construction Permit prior to initiating construction activities. See Section 8.5.4.6 and Section 8.5.6.2.
State Water Resources Control Board (SWRCB) Order 97-03-Division of Water Quality Storm Water Permit for Industrial Activities	A Storm Water Permit for Industrial Activities is required to regulate surface runoff during project operations.	If applicable, the KRCD CPP will obtain a General Construction Permit prior to initiating construction activities. See Section 8.5.4.6 and Section 8.5.6.2.
RWQCB Department of Health Services (DHS)	Requires obtaining a new or modifying an existing Waste Discharge Requirements Permit and a Wastewater Reclamation Permit to reuse effluent from WWTPs for power plant cooling.	Both Parlier and Sanger will apply to modify their existing Waste Discharge Requirements Permits to allow for delivery of secondary treated wastewater to the plant for reclamation. The KRCD will also have to obtain a Wastewater Reclamation Permit to reuse the effluent from the WWTPS. See Section 8.6.2

Table 8.5-7 Water Resources LORS KRCD CPP		
Regulation/Program	**Description**	**Project Applicability/ AFC Section Reference**
Porter Cologne Water Quality Act	The Central Valley RWQCB implements and enforced the federal NPDES permit program. Requires State and RWQCBs to adopt water quality initiatives to protect state Waters including an identification of beneficial uses and narrative and numerical water quality standards.	The KRCD CPP will conform to applicable state water standards. See Section 8.5.4 and Section 8.5.6.2.
California Water Code Sections 13550, 13551, 461 and SWRCB Resolution No. 75-58	These water code sections and policy statements encourage the conservation of water resources and the maximum reuse of wastewater, particularly in areas where water is in short supply.	KRCD proposes to use wastewater effluent for over 99% of the power plant water demands, which is consistent with these policies. See Section 8.5.3 and Section 8.5.6.2.
Title 22 of the California Code of Regulations, Section 60306 et seq.	Addresses the use of reclaimed water; including criteria for the use of reclaimed water for cooling and requirements that the cooling water is disinfected tertiary reclaimed water.	KRCD will tertiary treat reclaimed water from the Parlier and Sanger WWTPs prior to use for power plant cooling. See Section 8.5.3.2.
Local		
Fresno County General Plan - Water Quality Policies and Programs	The General Plan outlines policies, goals and implementation measures for water resources, flood control and storm water protection.	The KRCD CPP will conform to all water quality policies and programs, and will have zero discharge off-site from industrial activities. See Section 8.5.3.3.
California Well Standards Ordinance and California Well Standards, Bulletins 74-81 and 74-90.	The Fresno County Environmental Health System regulates the construction of new water wells, the reconstruction, repair or deepening of existing wells and the destruction of abandoned wells in unincorporated Fresno County.	Applicable permits for the installation of new wells will be obtained prior to construction. See Section 8.5.7.

8.5.6.1 Federal Clean Water Act

The CWA authorizes the United States Environmental Protection Agency (USEPA) to regulate discharges of wastewater and stormwater into surface waters by issuing NPDES permits setting pretreatment standards. The RWQCB implements these permits at the state level, but USEPA may retain jurisdiction at its discretion. For this reason, relevant NPDES permits are discussed below under state LORS.

During operations, the proposed KRCD CPP will not result in any discharges to surface water as a result of storm runoff or power plant blowoff. The CWA primary effect on the power plant is with regard to the control of soil erosion during construction and the need to prepare and implement site-specific erosion control plans and measures. This will be addressed in the SWPPP (see Appendix 8.5-3).

8.5.6.2 State

Central Valley Regional Water Quality Control Board

A General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (NPDES Permit No. CAS000002), also known as the General Construction Permit, is required for all construction activities that involve more than five acres of land disturbance. Modifications to the General Construction Permit, which were adopted in late 2002, expanded the NPDES program by lowering the threshold acreage of soil disturbance requiring permit coverage from five acres to one acre. The program modification became effective in March 2003. The General Construction Permit is implemented and enforced by the appropriate RWQCB. The General Construction Permit for the proposed power plant will be implemented and enforced by the Central Valley RWQCB, Fresno Office.

To be covered under the General Permit, a Notice of Intent (NOI) must be filed with the appropriate RWQCB and a SWPPP must be prepared. The SWPPP must also be kept onsite during construction and made available to the RWQCB or other appropriate local agencies upon request. A draft outline of the Construction SWPPP is included as Appendix 8.5-3.

State Water Resources Control Board (SWRCB) Order 97-03-Division of Water Quality authorizes general storm water permits for industrial activities. An industrial SWPPP will be prepared prior to operation of the power plant.

The RWQCB and the DHS will require that both the Parlier WWTP and the Sanger WWTP modify their existing Waste Discharge Requirements Permits to allow for delivery of secondary treated wastewater to the plant for reclamation. The KRCD will also have to obtain a Wastewater Reclamation Permit to reuse the effluent from the WWTPs. At least nine months

will be required to obtain these permits. Existing Waste Discharge Requirements permits for the Sanger and Parlier WWTPs will be modified administratively by the RWQCB staff to accommodate the revisions to effluent reuse. KRCD will apply for a Wastewater Reclamation Permit by submitting a preliminary application and engineering report with the RWQCB immediately after submitting this section to the California Energy Commission (CEC). The RWQCB will then review the application in conjunction with the CEC licensing process and communicate its findings to the CEC as part of the process. After completion of the CEC licensing process, KRCD will submit a final application to the RWQCB and a permit will subsequently be issued.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act, California Water Code Section 13000 et. seq., delegates the control of pollutant discharges to surface and groundwater from the SWRCB to the nine RWQCBs and identifies water quality criteria to protect state waters. This criteria includes the identification of beneficial uses, narrative and numerical water quality standards, and implementation procedures. The RWQCB branch with jurisdiction over the proposed power plant is the Central Valley RWQCB. No action is required from the proposed power plant to comply with this act. Actions from the RWQCB are discussed in the previous section.

California Water Code Sections 13550, 13551, 461 and State Water Resources Control Board Resolution No. 75-58

These water code sections and policy statements encourage the conservation of water resources and the maximum reuse of wastewater, particularly in areas where water is in short supply. In the 2003 Integrated Energy Policy Report, the CEC states:

> "The (State Water Resources Control) Board states that it "encourages…power generating utilities and agencies to study the feasibility of using wastewater for power plant cooling" and "encourages the use of wastewater for power plant cooling where it is appropriate". The Board also lists specific "discharge prohibitions" to limit the discharge of blowdown and waste waters from cooling facilities so as to "maintain existing water quality and aquatic environment of the state's water resources."

KRCD proposes to use wastewater effluent for over 99 percent of the power plant water demands, which is consistent with these policies. The power plant will also employ a ZLD that will eliminate any liquid blowdown and prevent degradation of the State's water resources.

Title 22 of the California Code of Regulations

Title 22 addresses the use of reclaimed water; in particular, Section 60306 sets the criteria for the use of reclaimed water for cooling. Such cooling water is defined as disinfected tertiary reclaimed water in Section 60401.230. Secondary treated effluent that is percolated and later pumped from the groundwater has been considered an acceptable cooling water source for other regional power plants.

8.5.6.3 Local

The KRCD CPP project site is located in unincorporated Fresno County, while the Sanger and Parlier WWTPs are located in the cities of Sanger and Parlier, respectively. In addition, all of the sites are located in CID. The KRCD CPP will follow local LORS set by these public agencies, as described below.

County of Fresno

The Fresno County General Plan outlines several policies, goals, and implementation measures for water resources, flood control and storm water protection. These objectives, which apply to KRCD CPP, are outlined below.

- Policy OS-A.23: The County shall protect groundwater resources from contamination and overdraft by pursuing the following effects:
  - Encouraging the use of treated wastewater for groundwater recharge and other purposes (e.g., irrigation, landscaping, commercial, and non domestic uses).
- Policy OS-A.25: The County shall minimize sedimentation and erosion through control of grading, cutting of trees, removal of vegetation, placement of roads and bridges, and use of off-road vehicles. The County shall discourage grading activities during the rainy season unless adequately mitigated to avoid sedimentation of creeks and damage to riparian habitat.

Fresno County Department of Community Health, Environmental Health, System, California Well Standards Ordinance and California Well Standards, Bulletins 74-81 and 74-90

The Fresno County Environmental Health System regulates the construction of new water wells, the reconstruction, repair or deepening of existing wells and the destruction of abandoned wells in unincorporated Fresno County. The Environmental Health System regulates these activities through the provisions of the California Well Standards Ordinance and the construction standards set forth in the California Well Standards, Bulletins 74-81 and 74-90. Water supply wells constructed for the project will be constructed in accordance with this ordinance and these

bulletins. The administering agency is the Fresno County Department of Community Health, Environmental Health System.

8.5.7 REQUIRED PERMITS AND AGENCY CONTACTS

The proposed KRCD CPP will also require several permits and authorizations from agencies whose responsibility it is to protect water resources. Permits that will likely be required by the proposed KRCD CPP are discussed below in Table 8.5-8.

Table 8.5-8
Water Resources Permit Schedule
KRCD CPP

Permit or Approval	Permit Applicability	Schedule
Storm Water Permit for Construction Activities (General Construction Permit)	Required to regulate the discharge of storm water during construction.	Permit will be obtained prior to construction. A draft outline of the construction SWPPP is included as Appendix 8.5-3.
Storm Water Permit for Industrial Activity	Required to regulate surface runoff during project operations.	Will be obtained prior to power plant operations.
Wastewater Reclamation Permit	Required to use recycled wastewater at the power plant.	A preliminary permit application will be made at the same time this report is filed with the CEC. The RWQCB will review the application in conjunction with the CEC licensing process. A final permit application will be made after CEC approval and the permit will be obtained prior to construction.
Grading Permit	Will be required for construction of stormwater basins, and any other earthwork to facilitate drainage.	The excavation contractor will be responsible for securing this permit prior to construction.
Encroachment Permit	Will be required for offsite linear facilities that pass through county and /or city road right-of-ways.	Applicable permits will be obtained prior to construction. (see Section 8.4, Land Use and Agriculture).

Table 8.5-8 Water Resources Permit Schedule KRCD CPP		
Permit or Approval	**Permit Applicability**	**Schedule**
Well Permit - To Construct, Deepen, Destroy, Recondition, or Repair a Well	Will be required for construction of a potable water well and shallow extraction wells on the project site, as well as any exploratory holes.	The well contractor will be responsible for securing this permit prior to construction.
CID	The proposed water pipeline interconnection to the Lincoln Ponds will cross four irrigation canals owned by CID.	KRCD will need permission, permits and/or agreements from CID to cross the canals and CID will need to approve the canal crossing designs prior to construction.
City of Parlier	The City will need to grant approval to construct and operate facilities on their property, including pipelines and storage ponds.	KRCD has already held discussions with the city about the project, their involvement, and their needed cooperation. KRCD has secured approval from Parlier to discharge the power plant's domestic effluent and tertiary treatment backwash water to the Parlier WWTP (see Appendix 6-2 in Chapter 6, Water Supply).
City of Sanger	The City will need to grant approval to construct and operate facilities on their property, including pipelines and storage ponds.	KRCD has already held discussions with the city about the project, their involvement, and their needed cooperation (see Appendix 6-2 in Chapter 6, Water Supply).

There are also several regulatory agencies responsible for implementing the water resources LORS addressed previously in Table 8.5-8. Contact information for applicable agencies is included in Table 8.5-9 below.

Table 8.5-9 List of Water Resources Agency Contacts KRCD CPP		
Agency	**Contact Person, Title and Email**	**Phone Number**
Central Valley Regional Water Quality Control Board 1685 E Street Fresno, CA 93706	Douglas Patteson, P.E. Senior Water Resource Control Engineer dpatterson@waterboards.ca.gov	(559) 445-5156
Fresno County Department of Public Works and Planning, Development Services Division 2220 Tulare St., 7th Floor Fresno, CA 93721	William M. Kettler Principal Staff Analyst wkettler@co.fresno.ca.us	(559) 262-4242
Consolidated Irrigation District 2255 Chandler Street PO Box 209 Selma, CA 93662	Mark Gilkey, General Manager mgilkey@cidwater.com	(559) 896-1660
City of Parlier 1100 East Parlier Avenue Parlier, CA 93648	Lou Martinez, City Manager citymanager@parlier.ca.us	(559) 646-3545
City of Sanger 1700 7th Street Sanger, CA 93657	John White, Public Works Director jwhite@ci.sanger.ca.us	(559) 876-6300

8.5.8 REFERENCES

California Department of Water Resources. Planning and Local Assistance. *Historical Groundwater Level Data*. Accessed website October 2006.

California Energy Commission. *2003 Integrated Energy Policy Report*. December 2003.

California Environmental Protection Agency, State Water Resources Control Board. *Construction Storm Water Programs*. Website accessed October 2006.

California Irrigation Management Information System (CIMIS). *Station Parlier #39*. Accessed website September 2006.

Carollo Engineers. *Wastewater Treatment Plant Master Plan Project Report, City of Sanger*. January 2006.

Federal Emergency Management Agency (FEMA). *Flood Insurance Rate Maps Numbers 06019C2160 F, 06019C2170 F, 06019C2700 F*. July 19, 2001.

Giersch & Associates, Inc. *City of Parlier, Fresno County California, Preliminary Report for the Findings of Compliance, Wastewater Treatment Master Plan with Land Acquisition*. January 2006.

HDR Engineering. *Wastewater Reclamation Evaluation, City of Sanger, California.* February 1992.

Kings River Conservation District, 2001-2003 Depth to Groundwater Report, February 2004.

Kings River Conservation District. *Kings River Service Area Annual Groundwater Report.* 2001.

Kings River Conservation District. *Artificial Groundwater Recharge in the Kings River Service Area.* 1999.

Patterson, 2006. Meeting between Kings River Conservation District staff and Douglas Patterson, California Regional Water Quality Control Board. 2006.

Quad Consultants. *Final Environmental Impact Report, City of Sanger Wastewater Collection, Treatment and Disposal Facilities Expansion*. June 1996.

Soil Conservation Service. United States Department of Agriculture. *Soil Survey, Eastern Fresno Area, California.* October 1971, pgs 55, 74, 79, 81, 147, sheet numbers 63, 73, 82.

United States Department of the Interior. Geologic Survey, *Geology, Hydrology and Water Quality in the Fresno Area, California*. 1969.