4.3 WATER RESOURCES

The following section presents the environmental setting, regulatory setting, impact analysis, and recommended minimization and avoidance measures for water resources at the Project site, including discussions regarding ground water, surface water hydrology, and storm water management. This section is based on the results of technical studies prepared for the Project, including: Grading Plans (Appendix C), Well Capacity and Aquifer Test (Appendix G), Preliminary Hydrology Report (Appendix I), and Storm Water Pollution Prevention Plan (Appendix L).

4.3.1 Environmental Setting

4.3.1.1 Surface Water

Surface Water Hydrology. The Project is located within the Santa Maria Valley. According to the Santa Barbara County Water Agency within their Water Supply and Demand, Current Uses and Future Estimates Report (GEI Consultants, 2013), the Santa Maria Valley covers 260 square miles and is crossed by the Santa Maria River which is formed by the confluence of the Cuyama and Sisquoc rivers near Fugler Point about 20 miles from the Pacific Ocean. The Santa Maria River is ephemeral, with no surface-through flows about 83 percent of the time. Much of the valley consists of a broad alluvial plain underlain by an extensive deposit of water bearing alluvium and semi consolidated sedimentary deposits. Surface drainage is primarily from the Sisquoc and Santa Maria Rivers that traverse the north side of the basin from east to west. Orcutt Creek, Bradley Canyon, Cat Canyon, and Foxen Canyon are the primary drainages on the south side of the basin.

Within the immediate Project area, the topography consists of a series of north-south aligned subdued hills with elevations ranging from about +500 to +1,000 feet above mean sea level. Cat Canyon Creek, the principal stream of the area, flows intermittently north toward the community of Sisquoc. This creek, as well as those in Long Canyon and Olivera Canyon, is well entrenched along most of its course. Evidence of rising water in the creek system is not apparent. Soils in the drainage areas are relatively thin, heavily developed with clay residuals, and of poor permeability. As such, the area is not considered a groundwater recharge area. Very limited agricultural development occurs in Cat Canyon with the valley floors locally being used for the dry farming of hay and grain (Fugro, 2012a).

The Project is contained within six watersheds which ultimately discharge into the Sisquoc River to the north. The watersheds consist of Cat Canyon (7,000 acres), Long Canyon (893 acres), Olivera Canyon (1,414 acres), and three unnamed blue lines (Unnamed #1 & #2 800 acres; Unnamed #3 218 acres). Cat Canyon is the principal stream in the area. All watersheds are intermittent and flow to the north toward the community of Sisquoc. All six creeks are well entrenched along most of their courses. For further detail and drawings, see TJ Cross's Preliminary Hydrology Report (Appendix I).

The Hydrological Soils Groups for areas within the Project site were obtained from the United States Department of Agriculture, National Resource Conservation Services, Web Soil Survey. Project site soils appear to be predominantly Group C with some Group A and D dispersed within the watersheds, as defined in the list below:

- Group C Soils have a slow infiltration rate when thoroughly wet. These soils also have a slow rate of water transmission;
- Group A soils have a high infiltration rate and low runoff potential when thoroughly wet. These soils also have a high rate of water transmission; and
- Group D soils have a very slow infiltration rate and high potential for water runoff. These soils have a very slow rate of water transmission.

Average rainfall in the area varies from about 12 to 16 inches per year (County of Santa Barbara, Public Works Department, Water Resources Division, 2011). Precipitation as measured at the Sisquoc Fire Station No. 23 averages about 15 inches per year. Almost 95 percent of the rainfall occurs between the months of November through April.

Flood Hazard Zones. In 1979, the County of Santa Barbara became a participating community in the National Flood Insurance Program. The National Flood Insurance Program makes federally backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce the potential for future flood damage. As part of the National Flood Insurance Program, the Federal Emergency Management Agency prepares flooding studies. These flooding studies include the delineation of flood hazard boundaries based on existing hydrologic, geologic, and topographic data. From these studies, Federal Emergency Management Agency prepares maps that show areas at risk from 100-year and 500-year floods. The majority of the Project site is located within Zone X, or within an area that has a 1 percent or less annual chance of flood. Areas located along the western of the Project site immediately adjacent to Cat Canyon Creek are located within flood zoned areas (A), indicating an area at risk from 100-year or greater flood events.

4.3.1.2 Groundwater

Santa Maria Groundwater Basin. The Project site is located in the southern portion of the Santa Maria Groundwater Basin near its boundary with the San Antonio Basin. According to the County of Santa Barbara 2011 Groundwater Report (County of Santa Barbara, Public Works Department, Water Resources Division, 2011), the Santa Maria Groundwater Basin Main unit is a 170 square mile alluvial basin drained by the 1,741 square mile Santa Maria River watershed and bordered by the Nipomo Mesa and Sierra Madre Foothills to the north, the San Rafael Mountains to the east, the Solomon-Casmalia Hills to the south, and the Pacific Ocean to the west. The basin supplies groundwater to the City of Santa Maria, Golden State Water Company, the City of Guadalupe, Casmalia Community Services District, and private oil and agriculture operations throughout the valley.

The Santa Maria Groundwater Basin includes three main areas: The main basin unit within Santa Maria Valley, the Nipomo Mesa unit, and the Arroyo Grande unit. Within the main basin unit, groundwater is found within alluvium and semi-consolidated sedimentary materials of the Plio-Pleistocene to Recent age. The water-bearing materials are up to 1,200 feet thick beneath the central area of the main basin unit. The older water-bearing materials include the Careaga Sand and the overlying Paso Robles formation. The main basin unit is considered unconfined in the eastern portion and semi-confined to confined west of Bonita School Road, near Guadalupe (GEI Consultants, 2013).

The gross perennial yield of the Santa Maria Groundwater Basin is estimated to be approximately 125,000 acre-feet per year. Water storage above sea level is estimated to be approximately 1.97 million acre-feet. The main source of groundwater recharge is estimated to be approximately 32,000 acre-feet per year and primarily flows via Twitchell Reservoir on the Cuyama River. Until 1996, groundwater was the source of water for all users in the Santa Maria Valley. The State Water Project Coastal Aqueduct pipeline was constructed through the area in 1996 and the City of Santa Maria currently has entitlement to 16,200 acre-feet per year, the City of Guadalupe has entitlement to 550 acre-feet per year, and the Golden State Water Company has entitlement to 500 acre-feet per year. Total municipal groundwater pumping within the basin in 2012 was approximately 10,260 acre-feet (GEI Consultants, 2013).

Litigation regarding the status and use of the groundwater basin was initiated in 1997 by the Santa Maria Valley Water Conservation District to adjudicate the groundwater basin (Case No. 1-97-CV-770214). One the main points of contention related to the water rights case was whether the basin was in overdraft. In its Phase III Decision, the court concluded that the basin was in a state of overdraft for purposes of adjudication. Recent reports indicate that the overdraft may be in the 2,000 to 3,000 acre-feet per year range, which is considered within the range of uncertainty given the data quality (County of Santa Barbara Water Agency, 2012). The stipulated settlement does not affect overlying property owners' ability to utilize groundwater on their property. Current groundwater use at the Project site is limited to approximately 0.32 acre-feet per year for ongoing cattle grazing operations.

McCroskey Well Capacity and Aquifer Test and Analytical Results. In October 2012, Fugro (Fugro, 2012b) completed a well capacity, aquifer test, and related assessment of the McCroskey WS-12 water well located along Long Canyon Road on the western boundary of the Project site (Appendix G). Refer to Figure 4.3-1 – Water Well Locations[1]. The purpose of the well capacity testing was to determine the current condition of the McCroskey WS-12 water well (depth, water level, well depth, location, and condition of perforations, etc.). Based on the condition assessment, Fugro then performed pump testing of the well to assess yield, water quality, and the groundwater production potential of the Paso Robles formation aquifer at the Project site.

Analysis of the groundwater produced (Attachment H of the Fugro McCroskey Well Capacity and Aquifer Test Report, 2012) indicates it to be of a calcium-sulfate chemical character with total dissolved solids concentration of 900 milligrams per liter. The groundwater is considered somewhat hard and contains a dissolved iron concentration of 1.3 milligrams per liter. According to the Report, the analytical results appear to be similar to groundwater quality analysis from this well performed in the late 1970s. The groundwater is considered to be a freshwater source that will be generally suitable for the intended Project uses.

At the time of the subject well capacity and aquifer testing activities, the water-bearing formation underlying the area of McCrosky WS-12 was sufficiently saturated to support the pumping rate of 125 gallons per minute (180,000 gallons per day). Additionally, Fugro concluded

[1] Due to their inactive status, Aera has decided to remove water wells Bonetti-WS1 and McCroskey-WS11 from the Project design. These wells have been removed from Figure 4.3-1; however, the proposed freshwater pipelines to these wells remain as part of the Project footprint and are included in all pertinent impact calculations within Section 4.0 (Environmental Analysis).

that properly designed and constructed groundwater supply wells located at various areas of the Project site perforated within the Paso Robles Formation at depths of 300 to 700 feet could produce groundwater of adequate quality at rates in the range of 250 gallons per minute (360,000 gallons per day).

4.3.2 Regulatory Setting

4.3.2.1 Federal Regulations

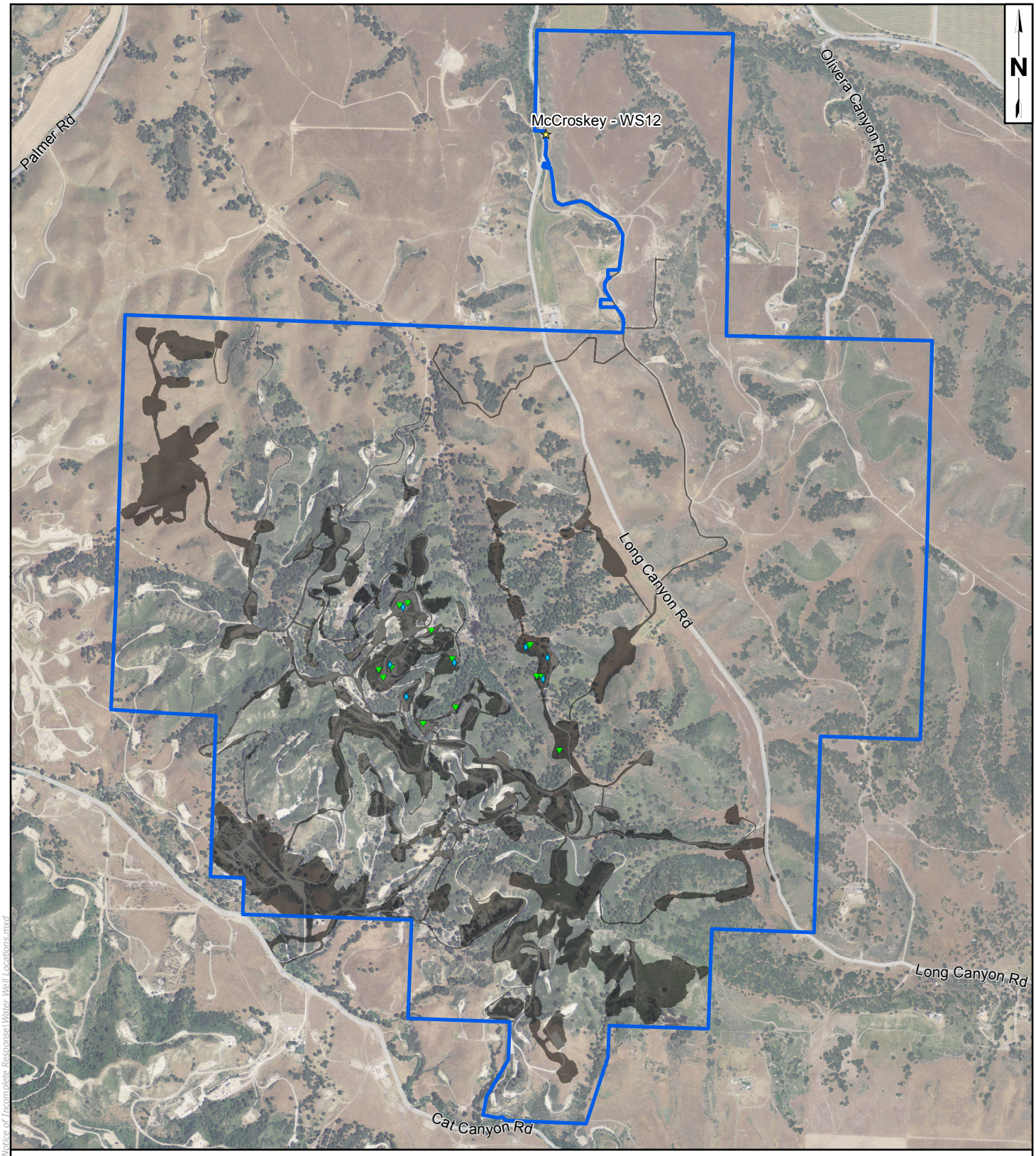
Federal regulations for water resources include the Clean Water Act (33 United States Code Section 1251 et seq.), formerly the Federal Water Pollution Control Act of 1972, which was enacted with the goal of restoring and maintaining the chemical, physical, and biological integrity of the waters of the United States. The Clean Water Act requires each state to protect, maintain, and restore water quality through the regulation of point and non-point source discharges to surface waters.

National Pollutant Discharge Elimination System. The National Pollutant Discharge Elimination System was established in the Clean Water Act to regulate discharges of municipal and industrial pollutants to waters of the United States. The 1987 amendments to the Clean Water Act established a framework for regulating municipal and industrial (including construction) storm water discharges under the National Pollutant Discharge Elimination System program. California was authorized by the U.S. Environmental Protection Agency to administer their own storm water permitting programs with a stipulation that they must have a program at least as stringent as the federal program.

Water quality standards mandated by the Clean Water Act are derived from the designated uses of the water body (e.g., recreation, water supply, aquatic life, agriculture); water quality criteria to protect designated uses (numeric pollutant concentrations and narrative requirements); an anti-degradation policy to maintain and protect existing uses and high quality waters; and general policies addressing implementation issues (e.g., low flows, variances, mixing zones). Many aspects of the Clean Water Act are regulated under primacy agreements with state level agencies. These relationships are discussed under section 4.3.2.2.

4.3.2.2 State Regulations

The State Water Resources Control Board is the umbrella agency with jurisdiction over water quality issues in the State of California. In addition to standards and regulations established by the Federal program, California adopted a number of other, more stringent legislative acts in order to further strengthen State water quality standards. These acts include the Porter-Cologne Water Quality Act, California Water Code, Title 23 of the California Code of Regulations, and the California Ocean Plan. Within California, the State Water Resources Control Board is responsible for developing and implementing water quality control policy. State Water Resources Control Board is the agency designated by the Environmental Protection Agency for administering applicable Federal Clean Water Act and Safe Drinking Water Act programs, which include adopting water quality standards for State waters.



Aera Energy LLC Property
Project Footprint

Surface Well Locations:
Fresh Water Well
Upper Sisquoc Water Production Well
Upper Sisquoc Water Injection Well

Source: County of Santa Barbara, TJCross 8-20-14, DPSI 2013
Land Survey, NAIP 2012 Image
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only.

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PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT	WATER WELL LOCATIONS	FIGURE 4.3-1
PROJECT NUMBER: 1002-0455 / DATE: June 2015		

Z:\Kristin\GIS Maps\Map Project\East Cat Canyon\Notice of Incomplete Response\Water Well Locations.mxd

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Nine Regional Water Quality Control Boards administer these Federal programs, including National Pollutant Discharge Elimination System compliance. The Central Coast Regional Water Quality Control Board is responsible for water quality permitting in Santa Barbara County where the Project is located. The Central Coast Regional Water Quality Control Board adopted a Revised Water Quality Control Plan, or Basin Plan, dated 1994. The Basin Plan designates beneficial uses and establishes water quality objectives for groundwater and surface water within the Central Coast Region. It has been amended, but not updated since 1994. Construction projects are required to comply with the statewide National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity (General Construction Permit) (Order No. 99-08-DWQ, Permit No. CAS000002). Under this program, construction activities that would result in earth disturbance of one or more acres are required to file a Notice of Intent to obtain a General Construction Permit. The applicant is required to develop a Storm Water Pollution Prevention Plan, which provides best management practices to manage storm water runoff from the Project site. Best management practices means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollutant of waters of the United States (40 Code of Federal Regulations §122.2). Construction activities are also regulated by the County through grading permits (Chapter 14 of the Santa Barbara County Code) and land use permits. These County permits address water quality from storm water and non-storm water discharges associated with both construction and post-construction Project site runoff.

Class II injection operations are under the California Division of Oil, Gas, and Geothermal Resource's jurisdiction, as the Division has Underground Injection Control Program primacy granted by the United States Environmental Protection Agency.

4.3.2.3 Local Regulations

The County of Santa Barbara has adopted policies in regards to water quality resources within the Project area which include siting criteria for new structures including avoidance of geological hazards and locations overlying regional groundwater basins. These regulations generally prevent the development of floodplain areas which would result in the flooding of developed areas.

The construction storm water general permit is directly regulated by the State Water Resources Control Board and Regional Water Quality Control Board, with the County of Santa Barbara assisting the Regional Water Quality Control Board with inspections and enforcement. The County's Municipal Separate Storm Sewer System permit, authorized by the Regional Water Quality Control Board, directly regulates the County by requiring certain requirements in the County's storm water control ordinance, which then directly stipulates certain requirements or analysis for the Project.

4.3.3 Impact Assessment Standards

4.3.3.1 Surface Water

According to the Santa Barbara County Environmental Thresholds and Guidelines Manual (2008), the assessment of impacts must account for construction-related impacts (i.e., vegetation removal, erosion, use of construction materials on the site, and staging of construction activities) and post-construction (or post-development) impacts (i.e., increases in impervious surfaces and

increased runoff, entrainment of pollutants, and effects of discharges on aquatic habitats and biota). A significant water quality impact is presumed to occur if the project:

- Is located within an urbanized area of the county and the project construction or redevelopment individually or as a part of a larger common plan of development or sale would disturb one (1) or more acres of land;
- Increases the amount of impervious surfaces on a site by 25 percent or more;
- Results in channelization or relocation of a natural drainage channel;
- Results in removal or reduction of riparian vegetation or other vegetation (excluding non-native vegetation removed for restoration projects) from the buffer zone of any streams, creeks or wetlands;
- Is an industrial facility that falls under one or more of categories of industrial activity regulated under the National Pollutant Discharge Elimination System Phase I industrial storm water regulations (facilities with effluent limitation; manufacturing; mineral, metal, oil and gas, hazardous waste, treatment or disposal facilities; landfills; recycling facilities; steam electric plants; transportation facilities; treatment works; and light industrial activity);
- Discharges pollutants that exceed the water quality standards set forth in the applicable National Pollutant Discharge Elimination System permit, the Regional Water Quality Control Board's Basin Plan or otherwise impairs the beneficial uses of a receiving waterbody;
- Results in a discharge of pollutants into an "impaired" waterbody that has been designated as such by the State Water Resources Control Board or the Regional Water Quality Control Board under Section 303 (d) of the Clean Water Act; or
- Results in a discharge of pollutants of concern to a receiving water body, as identified in by the Regional Water Quality Control Board.

Projects that are not specifically identified on the above list or are located outside of the "urbanized areas" may also have a project-specific storm water quality impact. Storm water quality impacts associated with these projects must be evaluated on a project by project basis for a determination of significance. The potential impacts of these projects should be determined in consultation with the County Water Agency, Flood Control Division, and Regional Water Quality Control Board. The issues that should be considered are:

- The size of the development;
- The location (proximity to sensitive waterbodies, location on hillsides, etc.);
- The timing and duration of the construction activity;
- The nature and extent of directly connected impervious areas;
- The extent to which the natural runoff patterns are altered;
- Disturbance to riparian corridors or other native vegetation on or off-site;
- The type of storm water pollutants expected; and
- The extent to which water quality best management practices are included in the project design.

4.3.3.2 Groundwater

Pursuant to Santa Barbara County's Adopted Thresholds and Guidelines Manual (October 2008) adverse environmental effects which can be caused by overdraft of an alluvial groundwater basin include:

1. Degradation of water quality. Water quality varies considerably from one basin to another. In general, water quality in the groundwater basins of Santa Barbara County is declining with continued use of the resource, particularly in areas where the water table has been significantly lowered. Factors attributable to man which contribute to continuing degradation include pollution by agricultural runoff waters laden with fertilizers and pesticides, percolation of water from public and private sewage treatment systems, use of imported water which increases the salt load on a basin, percolation of polluted urban runoff, the reduction of the natural "flushing" effect of water through-flow caused by lowered water levels and the upward or lateral influx of connate brines by over-pumping of the freshwater aquifers. Preventive measures are the best way to address the ongoing deterioration. In general, the amount of pollutants placed in the ground, and the level of overdraft in the basins, should be minimized;

2. Saltwater intrusion. Intrusion of marine salt water is a problem which could affect all of the coastal basins of Santa Barbara County. Recent USGS studies have shown that salt water has intruded a few hundred feet onshore in Storage Unit No. 1 of the "Santa Barbara City Basin." Computer modeling conducted as part of this work indicated that the rate of salt water advance was four times greater than the rate at which the salt water could be flushed out by natural processes. Prevention of salt water intrusion is thus a key concern of projects supported by coastal pumpage;

3. Land subsidence. Land subsidence can occur in alluvial basins where water levels have dropped due to pumpage. Substantial evidence has not been reported in Santa Barbara County. Land subsidence can be a significant problem which can damage structures;

4. Loss of well yield. Dropping water levels in a basin due to overdraft will reduce the rate at which individual wells will be able to produce water. Drilling more wells or deeper wells are the two methods of maintaining groundwater production to service a particular municipal or agricultural demand. There may be, however, technical, legal and economic limitations on the ability of individuals or public or private purveyors to use these methods. With these limitations, a continued drop in water levels due to overdraft may cause loss of agriculture and a reduction in the ability of water districts to serve existing demand;

5. Well interference. New pumpage as part of a proposed project may cause a loss of well yield in nearby wells due to 1) a drop in water level as a cone-of-depression develops, or 2) a drop in water level due to storage depletion in a small isolated area. This could result in the current use on adjacent parcels being no longer supportable by the existing well(s);

6. Reduction of surface water available to support biological resources. Pumpage of groundwater causes fluctuations over time in the elevation of the groundwater table. Lowering of the water table can affect biological resources on the land surface by reducing

access to water by deep-rooted native vegetation or by reducing discharge of groundwater (baseflow) in streambeds. Even if a basin were pumped at a hydrologic "safe yield" rate (long-term water levels remain stable) a drop in water levels during a drought could adversely affect biologic resources; and

7. Based on the methodology for alluvial basins established by the County Environmental Thresholds Manual (revised January 2009), the applied Threshold of Significance for projects within the Santa Maria Groundwater Basin is 25 AFY.

4.3.4 Impact Analysis

4.3.4.1 Surface Water

Project Storm Water Pollution Prevention Plan. As discussed above, under the Construction General Permit the State of California will require Aera to prepare and implement a Storm Water Pollution Prevention Plan for construction activities at the Project site. A preliminary Storm Water Pollution Prevention Plan (Appendix L) has been prepared for the Project and will be finalized prior to the start of any ground disturbing activities.

Project grading, road streambed crossing improvements, and Project infrastructure construction could result in impairment of water quality in local drainages and underlying groundwater. Approximately 305 acres will be temporarily disturbed during construction of the Project (Phase I and Phase II).

The Storm Water Pollution Prevention Plan includes the following measures to reduce off-site water quality impacts during construction:

- Implementation of erosion control measures, including: preservation of existing vegetation (where possible), earth dikes and drainage swales, velocity dissipation devices, slope drains, silt fences, fiber rolls, and gravel bag berms.
- Implementation of Best Management Practices, including: stabilized construction entrance/exit, exit tire shakers, wind erosion control, stockpile management, controlled areas for vehicle and equipment cleaning, fueling, and maintenance; specifications for concrete curing and finishing; proper hazardous materials storage and use; spill prevention and control; and control of waste.
- Aera will install and maintain storm water pollution prevention control measures and assure that any necessary corrections/repairs are made promptly and that the Project complies with the Storm Water Pollution Prevention Plan, the Construction General Permit, and approved plans. The Storm Water Pollution Prevention Plan will include implementation of non-storm water management and materials/waste management activities, including monitoring discharges (dewatering, diversion devices), general site clean-up, spill control, and ensuring that no materials are discharged in quantities that will have an adverse effect on receiving waters. The Storm Water Pollution Prevention Plan also addresses post-construction conditions to ensure that the Project will comply with Santa Barbara County's post-construction storm water standards.

Oil and gas production activities are conditionally exempt from submittal and implementation of Industrial Storm Water Pollution Prevention Plans under the State Water Resources Control Board's General Order No. 97-03. The State Water Resources Control Board

recently adopted a new Industrial General Permit (Order No. 2014-0057-DWQ) that includes "…oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or that has come into contact with any overburden, raw material, intermediate products, finished products by-products, or waste products located on the site of such operations" (Order No. 2014-0057-DWQ, Attachment A). Pursuant to Title 40, Code of Federal Regulations, Section 122.26(a)(v)(D)(2)(ii) the Project is exempt from this requirement unless there is a reportable discharge of pollutants from the Project site.

Surface Water Quality/Quantity. Based on the Project design, implementation of the Project will not significantly modify or change any surface water rivers, tributaries, or drainages within the Project area. There will be no direct discharge to surface waters and therefore no alteration of surface water flows or quality will occur, including (but not limited to) temperature, dissolved oxygen content, turbidity, etc. TJ Cross Engineers, on behalf of Aera, has prepared a Preliminary Hydrology Study (Appendix I) that presents how surface water runoff will be managed during Project operations. Numerous detention basins have been included in the Grading Plans (Appendix C) that will control surface water runoff from the site and provide spill containment in the event of an upset.

Two site entrance culverts are proposed as part of the Project, one located at Cat Canyon Road and a second at Long Canyon Road. The primary Project site entrance (Cat Canyon Entrance) crossing over Cat Canyon Creek will be a 20-foot long by 12-foot high U-shaped structure with a natural bottom. The other structure (a 4-foot by 4-foot box culvert) will be located at a secondary Project site entrance off of Long Canyon Road (Long Canyon Entrance #1). Both site entrance culverts are sufficiently sized to handle the 100 year post construction flow (TJ Cross Engineers, 2014). Both of the culvert installations will be subject to California Department of fish and Wildlife stream alteration agreements. During Phase II, two smaller east side entrances from Long Canyon Road will be constructed to provide adequate access to new well pads. These smaller entrances are expected to utilize "Arizona" swale crossings over a shallow drainage area.

4.3.4.2 Groundwater

Ground Water Quality/Quantity. While the Project will not use fresh water for steam generation, fresh groundwater will be needed for ancillary purposes including fire protection, lavatories, showers, equipment cleaning, dust control, landscape irrigation, and also to support the initial (~3-5 years) planting and nurturing of Project oak replacement trees. Water conservation measures, including drip irrigation, low flow toilets, and alternative dust control measures, will be used where practicable to reduce fresh groundwater use. Fresh groundwater for the Project will be sourced from the water wells that currently exist on the site, or due to the age of those existing wells, from two to three new wells that will replace them. These wells are completed in the Careaga sandstone and the Paso Robles formation, which are separated from the oil and gas reservoir below by a thick, pervasive seal. It is estimated that fresh groundwater consumption during Project operations will be between 16.32 and 20.92 acre-feet per year, plus an additional 3.58 acre-feet per year for oak tree replacement watering during the first three to five years of the Project. Water use by ongoing cattle grazing operations is not anticipated to change as part of the proposed Project. Table 4.3-1 below provides a summary of the proposed fresh water uses and average quantities.

Table 4.3-1. Annual Fresh Water Use During Project Operations

Use	Minimum (acre-feet per year)	Maximum (acre-feet per year)
Staff Water Use (restrooms, showers, kitchen)[a]	2.2	4.5
Landscape Irrigation	0.20	0.20
Fire Water System Testing/ Flushing	0.52	0.52
On-site Dust Control/ Hydro-seeding	13.4	13.4
Well Drilling [b]	0.00	2.30
Total[c]	**16.32**	**20.92**
Oak Tree Irrigation (for first 3-5 years)	3.58	3.58

Note:
a. Assumes 40 employees.
b. Assumes approximately 250 barrels (7,875 gallons) of water per well. The peak year will involve the drilling of 95 wells.
c. Total does not include 0.32 acre-feet per year for ongoing cattle grazing operations. Water use for cattle grazing is not anticipated to change under the proposed Project.

Non-potable water will be used to generate the steam that will be injected into the reservoir to enhance oil recovery. No fresh water will be used to generate steam for the Project. The majority of the steam will be generated from produced water from the Brooks oil reservoir, which is anticipated to peak at an average production rate of 35,000 to 40,000 barrels of water per day. The Brooks reservoir water is not suitable for domestic or agricultural use due to its high solids and salinity content.

To supplement the expected produced water volumes reused to generate steam, additional brackish (high salinity content) water will be produced from the Upper Sisquoc formation, which overlies above the Brooks reservoir. In the vicinity of the Project site, the Sisquoc formation is another oil reservoir with similar water composition as the Brooks reservoir, and an ideal source for supplemental water for steam generation. To offset withdrawal from the Sisquoc formation and help maintain reservoir pressure, excess water, including brine from water softening, will be re-injected into the Sisquoc formation. Injection into this oil and gas producing reservoir will contribute to pressure maintenance and it is intended that the water injection wells be permitted as such through the California Division of Oil, Gas, and Geothermal Resources. Peak Sisquoc formation withdrawal and re-injection for Phase I and Phase II is anticipated to be approximately 15,500 barrels of water per day and 5,800 barrels of water per day, respectively.

Land Subsidence. Subsidence is a lowering of the ground surface elevation as a result of withdrawal of fluids, including groundwater, oil, or gas. Withdrawal of such fluids can result in a net decrease in the pore pressure, thus allowing the soil grains to pack closer together. This

closer grain packing results in less volume and the lowering of the ground surface. The Project re-injection of water subsequent to steam generation will maintain formation pressures of the Brooks and Sisquoc formations and prevent conditions associated with land subsidence. The oil reservoir at the Project site lies within a geologic anticline at a depth of approximately 3,000 feet, and overlain by a capstone of impermeable rock materials. Therefore, petroleum production activities are not anticipated to result in ground subsidence due to fluid withdrawal.

Loss of Well Yield. The Project will utilize existing fresh water wells (or replacements of same) for the limited fresh water use planned. There are no incremental fresh water wells proposed for the Project. Average water usage is expected to be less than 17,000 gallons per day. Due to their age, the Paso Robles and Carreaga Formation materials and older alluvium are not likely to be subject to hydroconsolidation, which would impact well yield. Through design of the Project as outlined within avoidance and minimization measure GEO-1, no significant impact to well yield due to hydroconsolidation will result.

Well Interference. Fresh water usage for the Project will utilize up to three existing fresh water wells or replacements of the same. There are no incremental fresh water wells proposed for the Project. Well capacities and spheres of influence will be monitored according to regulatory requirements to prevent interference among them.

Biological Resources Effects. The Project does not utilize any surface water and will not reduce the surface water available to biological resources. This issue is further addressed in Section 4.4, Biological Resources. Through the implementation of required plans and programs, impacts to biological resources will be minimized.

4.3.5 Project-Incorporated Avoidance and Minimization Measures

According to the County of Santa Barbara Environmental Thresholds and Guidelines Manuel (2008), if water quality impacts are considered from the beginning stages of a project, more opportunities are available for water quality protection. As such, the following measures have been included in Project design to minimize water quality impacts:

- **WATER-1. Spill Prevention, Control, and Countermeasures Plan and Storm Water Pollution Prevention Plan.** The Project will comply with the approved facilities-approved Spill Prevention, Control, and Countermeasures Plan, and the Project-specific construction Storm Water Pollution Prevention Plan, including:
  a) All fueling of vehicles and heavy equipment will occur in designated areas. Designated areas will include spill containment devices (e.g., drain pans) and absorbent materials to clean up spills;
  b) Vehicles and equipment will be maintained properly to prevent leakage of hydrocarbons and other fluids. Vehicle engine maintenance will occur in designated areas, which will include spill containment devices and absorbent materials to clean up spills;
  c) Any accidental spill of hydrocarbons or other fluids that may occur at the work site will be cleaned immediately. Spill containment devices and absorbent materials will be maintained on the work site for this purpose. The Governor's Office of Emergency Services will be notified immediately in the event of a reportable

quantity accidental spill to ensure proper notification, clean up, and disposal of waste;

d) Waste and debris generated during construction will be stored in designated waste collection areas and containers away from drainage features, and will be disposed of regularly;

e) Convenient, portable sanitary/septic facilities will be provided during construction activities. These facilities will be well maintained and serviced, and wastes will be treated and disposed of in accordance with state and local requirements;

f) Storm water pollution prevention best management practices will be used around the construction area perimeters during construction and around any construction operations that could potentially generate storm water pollution, according to the project specific construction storm water best management practice plan, or surface water quality management plan, as required;

g) Runoff will be conveyed to prevent erosion from slopes and channels and directed to project detention basins; and

h) Disturbed slopes will be re-vegetated with appropriate native or drought tolerant vegetation.

- **WATER-2. Channel Crossings.** Permanent channel crossings will be stabilized and energy dissipaters such as rip rap will be used at the outlet of storm drains, culverts or channels that enter unlined channels to minimize erosion potential.

- **WATER-3. DOGGR Permits.** The Project will produce non-potable water from the relatively high salinity hydrocarbon-bearing upper Sisquoc formation sands as a water source for steam production and then re-inject that water back into the upper Sisquoc formation sands following separation from other produced fluids. Aera Energy LLC will coordinate with the California Division of Oil, Gas, and Geothermal Resources Underground Injection Control program to obtain any required permits for that activity.

4.3 WATER RESOURCES 4.3-1
4.3.1 Environmental Setting 4.3-1
4.3.2 Regulatory Setting 4.3-4
4.3.3 Impact Assessment Standards 4.3-7
4.3.4 Impact Analysis 4.3-10
4.3.5 Project-Incorporated Avoidance and Minimization Measures 4.3-13

Table 4.3-1. Annual Fresh Water Use During Project Operations 4.3-12

Figure 4.3-1. Water Well Locations 4.3-5