D.7 Hydrology and Water Quality

Section D.7.1 provides a summary of the existing hydrology and water quality conditions present within the project area and the vicinity of the proposed SNGS Facility. Applicable regulations, plans, and standards are listed in Section D.7.2. Potential impacts and mitigation measures for the Proposed Project are presented in Section D.7.3, and alternatives are described and discussed in Section D.7.4. Mitigation monitoring, compliance, and reporting are discussed in Section D.7.5. Section D.7.6 lists the references cited in this section.

D.7.1 Environmental Setting for the Proposed Project

This section presents a discussion of surface water, drainage, flooding, water quality, and groundwater resources in the project area. Baseline hydrologic conditions in the project area were obtained from conducting reconnaissance-level surveys; SNGS, LLC's PEA (2007); aerial photos; and other relevant resource documents available from local city, county, and state water agencies.

D.7.1.1 General Setting

The project area is located within the Sacramento River Basin and the Sacramento Hydrologic Area. The Sacramento River and San Joaquin River basins together make up approximately one-fourth of the total area of the State of California and over 30% of the state's irrigable land. The Sacramento and San Joaquin rivers, combined, account for approximately 51% of the state's water supply. Surface water from the two drainage basins joins and forms the Sacramento Delta, which ultimately drains to the San Francisco Bay. The Sacramento River Basin alone extends 27,210 square miles and includes the entire area drained by the Sacramento River, including the Proposed Project area. Mean precipitation in the project area is 19.9 inches per year, with over 85% of rainfall occurring from October through March. The 24-hour 100-year rainfall event is 4.23 inches, and the 10-year 24-hour rainfall event is 2.98 inches.

The Sacramento River Hydrologic Region is the main water supply for much of California's urban and agricultural areas. Annual runoff in the Hydrologic Region averages about 22.4 million acre feet (maf), which is nearly one-third of the state's total natural runoff. Major water supplies in the region are provided through surface storage reservoirs. In all, there are more than 40 major surface water reservoirs in the region. Municipal, industrial, and agricultural supplies to the region are about 8 maf, with groundwater providing about 2.5 maf of that total. Much of the remainder of the runoff goes to dedicated natural flows, which support various environmental requirements, including in-stream fishery flows and flushing flows in the Delta (DWR 2003).

D.7.1.2 Surface Water

As shown in Figure D.7-1 and listed in Table D.7-1, the proposed compressor station, wellhead, and pipeline would be located within the Morrison Creek watershed. Pipeline segment one would cross Morrison Creek. The Morrison Creek stream group discharges to the Beach-Stone Lakes that flow southwest to the Delta. There are approximately 11 creeks that drain into Morrison Creek, including Elder Creek, Elk Grove Creek, Strawberry Creek, Florin Creek, Union House Creek, Gerber Creek, and Whitehouse Creek. Morrison Creek and its tributaries have been extensively relocated and channelized as a result of urban development.

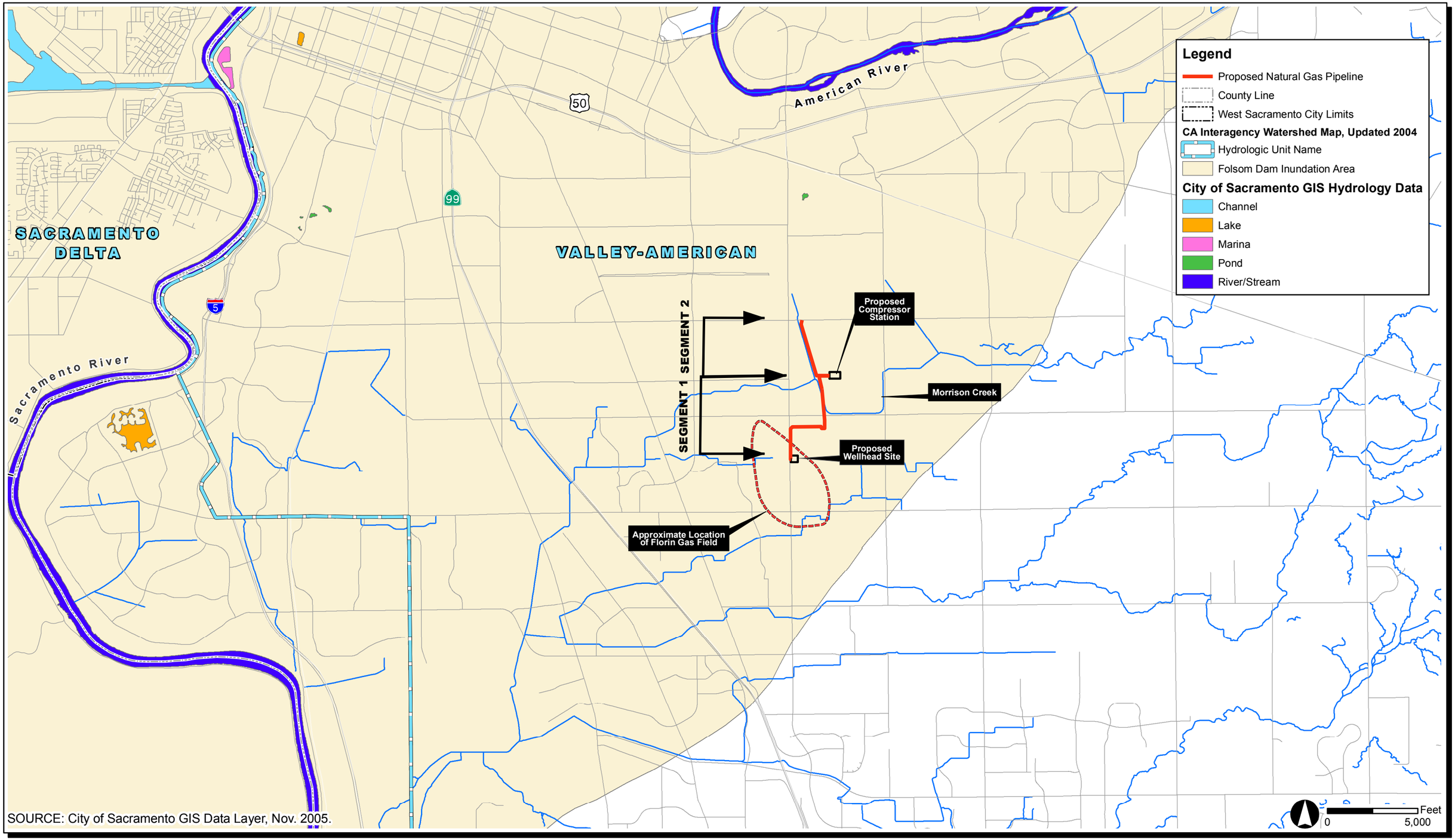
Table D.7-1
Waterbodies Crossed by the Proposed Project

Waterbody	Watershed	Proposed Crossing Method	Location
Morrison Creek	Morrison Creek	Horizontal Directional Drill	Pipeline route, City of Sacramento

D.7.1.3 Groundwater

Groundwater can be defined as subsurface water that occurs beneath the ground surface in soils and other geological formations. When groundwater occurs in a saturated geological unit that yields enough water to supply wells or springs, it can be defined as an aquifer.

A groundwater basin is a hydrogeologic unit containing a large aquifer or several aquifers that are interrelated. However, in the Sacramento area, usable groundwater also occurs outside of these identified and mapped basins. Therefore, according to the Basin Plan (CVRWQCB 1994), for planning and regulatory purposes, the term "groundwater" includes all subsurface waters that occur in fully saturated zones and fractures within soils and other geologic formations, whether or not these features meet the definition of an aquifer or occur within identified groundwater basins. Rivers and streams such as the American, Cosumnes, and Sacramento rivers recharge local groundwater and aquifers. Subsurface inflow and deep percolation also contribute to groundwater recharge. The groundwater has also been contaminat~~ion~~ed with tricholorethylene (TCE)~~EC~~ and is currently undergoing ground-water pumping as a portion of the remediation at the former Sacramento Army Depot.



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Sacramento Natural Gas Storage Project - EIR

Hydrology Map

FIGURE D.7-1

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The proposed wellhead, compressor station, and pipelines would be located within the Sacramento Valley Groundwater Basin, South American Subbasin. The Sacramento Valley Groundwater Basin underlies the area from Tehama County in the north to Solano~~a~~ and Sacramento counties in the south, covering a total area of approximately 5,000 square miles. The shale cap covering the area is estimated to be 3,500 feet bgs. It is overlain by the Starkey Formation and Mokellumne Formation. Two shale units are interbedded between the two formations. Groundwater within the subbasin primarily occurs in a shallow aquifer contained in the Modesto Formation or in a deep aquifer consisting of the Mehrten Formation. The shallow aquifer extends to approximately 200 to 300 feet below the ground surface. The depth to groundwater has been documented at 65 to 75 feet below the ground surface (SNGS, LLC 2007). The base of the deep aquifer extends to as much as approximately 1,300 feet below the ground surface. Cap rock consisting of shale from 150 to 300 feet thick occurs below the aquifer and forms a seal that has contained the natural gas below this aquifer. Groundwater in both the upper and lower aquifers is suitable for municipal water supplies, with the upper aquifer generally having higher quality**.**

Eight wells were drilled in the Florin Gas Field in the late 1970s and 1980s. Only six of these wells entered the field, with the other two missing the field to the southwest and northeast (SNGS, LLC 2007). Based on records from the California Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR) (Matthews 2006), all of these wells were abandoned according to DOGGR regulations including the well from the cap rock, the well from the freshwater table, and the well from the surface.

Several areas of soil and groundwater contamination have been documented at the Depot Park where the proposed compressor station would be located. Prior to remediation, the soil and groundwater at the site were contaminated with heavy metals, trichloroethylene (TCE), tetrachloroethylene, carbon tetrachloride, pesticides, volatile organic compounds (VOCs), and polychlorinated biphenyls. Currently, the only groundwater contamination above the action levels is TCE. The TCE plume is being pumped and treated, and the U.S. Army monitors the groundwater conditions quarterly.

D.7.1.4 Water Quality

Water quality refers to the effect of natural and human activities on the composition of water. Water quality is expressed in terms of measurable physical and chemical qualities that can be degraded by urban runoff, illicit discharges, and even planned water use. It is generally agreed that urban runoff transported by municipal stormwater conveyance systems is one of the principal causes of water quality problems in most urban areas. Stormwater that accumulates on impervious surfaces, such as parking lots, roof tops, and streets, drains directly and indirectly to waters of the U.S.

Identifying beneficial uses is one way that water quality is managed in California. State law defines beneficial uses so that waters can be protected against water quality degradation. The Central Valley Regional Water Quality Control Board (CVRWQCB) has assigned beneficial uses to the major waterbodies within their jurisdiction. In general, beneficial uses of any specifically identified waterbody would also apply to its tributary streams. The Sacramento River has numerous beneficial uses, including municipal and agricultural water supply, recreation, and fisheries. Beneficial uses for Morrison Creek are associated with the Sacramento River but exclude aquatic life support, warm freshwater habitat, and overall use support due to pesticides from agricultural and municipal/urban runoff.

The Federal Clean Water Act (CWA) Section 303(d) requires that states assess the quality of their waters every 2 years and publish a list of those waters not meeting established water quality standards. Water quality standards found in the Basin Plan (CVRWQCB 1994) include beneficial uses, water quality objectives necessary to protect beneficial uses, and the antidegradation policy. For waterbodies placed on the 303(d) List of Water Quality Limited Segments, states are required to develop total maximum daily loads (TMDLs) for the pollutant(s) that are causing standards impairment. A waterbody remains on the list until a TMDL is adopted and the water quality standards are attained or there are sufficient data to demonstrate that water quality standards have been met and that delisting should take place. Table D.7-2 provides a summary of impaired waters in the vicinity of the Proposed Project.

Table D.7-2
2002 California 303(d) List and Total Maximum Daily Load (TMDL) Priority Schedule

Waterbody	Pollutant/Stressor	Potential Source	TMDL Priority
Sacramento River	Diazinon Mercury Unknown Toxicity	Agriculture Resource Extraction Unknown	High Medium Low
Morrison Creek	Diazinon/chlorpyrifos	Agriculture Urban Runoff	High

D.7.1.5 Floodplains

The Sacramento area is relatively flat and has required a comprehensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels to control flow from regional streams and creeks during large storm events. During large storm events, tributaries such as Morrison Creek discharge into the Sacramento and American rivers, increasing the risk of flooding in the area. According to the Federal Emergency Management Agency (FEMA) flood zone map shown in Figure D.7-2, the compressor station, pipeline segment two, and portions of pipeline segment one would be subject to flooding during a 100-year storm event.

The wellhead site and portions of pipeline segment one would not be within the 100-year flood zone. Figure D.7-2 shows FEMA flood zones with respect to the Proposed Project facilities.

D.7.1.6 Dam Failure Inundation Area

To assist local jurisdictions in developing evacuation plans for possible inundation areas below dams, the State Office of Emergency Services and the Department of Water Resources (DWR) have identified areas of potential inundation in the event of dam failures throughout California (DWR 2008). These agencies have also estimated when flood waters would arrive at downstream locations should failure of a dam occur. Projected inundation limits are approximate and assume severe hypothetical failures, thus showing all potential flooded areas in the improbable occurrence of failure (see Figure D.7-1). The natural gas field, wellhead, compressor station, and pipeline segments one and two are within the inundation zone predicted for Folsom Dam. Folsom Dam is located approximately 19 miles northeast of the project area. If Folsom Dam were to fail, water would flow westerly along the American River channel toward these project components.

D.7.2 Applicable Regulations, Plans, and Standards

D.7.2.1 Federal Regulations

Clean Water Act

Increasing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act (CWA) (33 U.S.C. §1251 et seq.). The CWA established basic guidelines for regulating discharges of pollutants into the waters of the U.S. The CWA requires that states adopt water quality standards to protect public health, enhance the quality of water resources, and ensure implementation of the CWA.

National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) permit program, as authorized by Section 402 of the CWA, was established to control water pollution by regulating point sources that discharge pollutants into waters of the U.S. In the State of California, the Environmental Protection Agency (EPA) has authorized the State Water Resources Control Board (SWRCB) permitting authority to implement the NPDES program. In general, the SWRCB issues two baseline general permits: one for industrial discharges and one for construction activities. The Phase II Rule that became final on December 8, 1999, expanded the existing NPDES program to address stormwater dischargers from construction sites that disturb land equal to or greater than 1 acre.

Section 401 of the Clean Water Act

Section 401 of the CWA requires an applicant for a federal permit, such as the construction or operation of a facility that may result in the discharge of a pollutant, to obtain certification of those activities from the state in which the discharge originates. This process is known as the Water Quality Certification. For projects in Sacramento County, the CVRWQCB, Region 5 issues Section 401 permits.

Section 404 of the Clean Water Act

Section 404 of the CWA established a permitting program to regulate the discharge of dredged or filled material into waters of the U.S., which include wetlands adjacent to national waters. This permitting program is administered by the Army Corps of Engineers (ACOE) and enforced by the EPA.

Section 10 of the Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403) requires the ACOE to authorize construction of any structure in or over navigable waters of the U.S. or obstruction or alteration in a navigable water. Structure or work outside the limits defined for navigable waters of the U.S. requires a Section 10 permit if the structure or work affects the course, location, condition, or capacity of the waterbody. Navigable waters are defined as waters that are subject to the ebb and flow of the tide.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) (42 U.S.C. §201) was originally passed by Congress in 1974 to protect public health by regulating the public drinking water supply. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells. The act authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water. The EPA states that established drinking water standards must be met, and water agencies work together to enforce standards.

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Sacramento Natural Gas Storage Project - EIR

FEMA Flood Zone A

FIGURE D.7-2

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Through Section 40, Part 144 of the Code of Federal Regulations (CFR), the SDWA prohibits any injection activity that could allow the movement of fluid-containing contaminants into underground sources of drinking water if the presence of that contaminant could cause a violation of any primary drinking water regulation under 40 CFR 142, or that would otherwise adversely affect public health. This regulation applies to Classes I, II, and III and allows the director to take emergency action if a known contaminant is present or is likely to enter a public water system or underground drinking water source.

D.7.2.2 State Regulations

Streambed Alteration Agreement

Sections 1601-1603 of the California Fish and Game Code require an agreement between the California Department of Fish and Game (CDFG) and a public agency proposing to substantially divert or obstruct the natural flow or effect changes to the bed, channel, or bank of any river, stream, or lake. The agreement is designed to protect the fish and wildlife values of a river, lake, or stream.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1967 (California Water Code, Section 13000 et seq.) requires the SWRCB and the nine RWQCBs to adopt water quality criteria to protect state waters. These criteria include the identification of beneficial uses, narrative and numerical water quality standards, and implementation procedures. The criteria for the project area are contained in the *Fourth Edition of the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins* adopted by the CVRWQCB on December 9, 1994.

State Water Resources Control Board

The State Water Resources Control Board (SWRCB) is responsible for issuing stormwater permits in accordance with the NPDES program. For projects disturbing one or more acres of land, the applicant must file a notice of intent (NOI) for coverage under the General Permit for Stormwater Discharges Associated with Construction Activity (General Permit) and prepare a Stormwater Pollution Prevention Plan (SWPPP) that specifies best management practices (BMPs) to prevent pollutants from contacting stormwater and procedures to control erosion and sedimentation.

Regional Water Quality Control Board

Sacramento County falls within the jurisdiction of the Region 5 RWQCB. Each RWQCB is responsible for water quality control planning within their region, often in the form of a basin

plan. The RWQCB is also responsible for implementing the provisions of the General Permit, including reviewing SWPPPs and monitoring reports, conducting compliance inspections, and taking enforcement actions. In addition, the RWQCB may issue individual dewatering permits for discharges associated with construction projects.

California Code of Regulations

California Code of Regulations (CCR), Title 14, Division 2, Chapter 4 (Development, Regulation, and Conservation of Oil and Gas Resources) contains regulations specific to oil and gas field practices, including preparation of an oil spill contingency plan and a blowout prevention and control plan. 14 CCR 1724.9 pertains to gas storage projects and requires submittal to and approval from the DOGGR of the characteristics of the cap rock, calculations of the oil and gas reserves of storage zones prior to injection, a list of proposed surface and subsurface safety devices to ensure safety of the project, and the proposed wastewater disposal method. Similarly, 14 CCR 1724.10 contains requirements for underground injection projects, including drilling procedures; a chemical analysis of the injecting product; and data showing that no damage to life, health, property, or natural resources is occurring as a result of the project.

D.7.2.3 Regional and Local Regulations

Municipal Stormwater Permit

The City of Sacramento, County of Sacramento, and the cities of Citrus Heights, Elk Grove, Folsom, and Galt were issued an NPDES Municipal Stormwater Permit by the CVRWQCB (Order No. R5-2002-0206). The permit requires the development and implementation of BMPs in planning and construction of private and public development projects. Development projects are also required to include BMPs to reduce pollutant discharges from the project site in the permanent design. BMPs associated with the final design are described in the Model Standard Urban Stormwater Mitigation Plan. To comply with the NPDES Municipal Permit, the City of Sacramento prepared a Stormwater Quality Improvement Plan. The plan requires applicants for new construction projects to address City and state regulations through development and approval of an Erosion and Sediment Control Plan**.**

County of Sacramento

The County of Sacramento limits discharges of pollutants to waterbodies and the local stormwater conveyance systems through its stormwater management and discharge control code (Sacramento County Code, Chapter 15.12). The code requires the implementation of BMPs for construction and post-construction phases of any project issued a building permit. In addition, Chapter 16.44 requires a Grading and Erosion Control Permit for projects that generate 350 cubic yards or more of soil or result in greater than 1 acre of disturbed land.

City of Sacramento

The City of Sacramento has established ~~municipal~~ city codes to govern discharges to the municipal separate storm sewer systems and other water resources, as well as comply with their NPDES Municipal Permit. Sacramento City Code Chapter 13.16 addresses stormwater management and discharge control, and Chapter 15.88 addresses grading, erosion, and sediment control.

D.7.3 Environmental Impacts and Mitigation Measures for the Proposed Project

D.7.3.1 Definition and Use of Significance Criteria

The following significance criteria are based on the CEQA Checklist in Appendix G to the CEQA Guidelines (14 CCR 15000 et seq.). Water resource impacts would be considered significant if the project:

- Violates any water quality standards or waste discharge requirements
- Substantially depletes groundwater supplies such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)
- Substantially alters the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river in a manner that would result in substantial erosion of siltation on or off site
- Substantially alters the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increases the rate or amount of surface runoff in a manner that would result in flooding on or off site
- Creates or contributes runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff
- Otherwise substantially degrades water quality
- Places structures within a 100-year flood hazard area structures that would impede or redirect flood flows
- Exposes people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam
- Results in or is subject to inundation by seiche, tsunami, or mudflow.

D.7.3.2 Applicant Proposed Measures

Table D.7-3 presents the applicant proposed measures (APMs) proposed by SNGS, LLC to reduce impacts to hydrology and water quality.

Table D.7-3
Applicant Proposed Measures for Hydrology and Water Quality

APM No.	Description
1	SNGS, LLC would identify work areas and would ensure that: • Construction activities, equipment, and associated activities (e.g., staging areas) are confined to the designated work zones • Areas supporting sensitive resources (e.g., nearby seasonal wetlands and special-status species' habitat) are avoided. Construction equipment would be confined to a designated work zone in the project area. Before ground-disturbing activities are initiated, the work zone would be clearly staked and flagged. Where feasible, all adjacent waters and wetlands would be avoided and would be designated as exclusion zones during the preconstruction phase.
2	SNGS, LLC would conduct Worker Environmental Awareness Program (WEAP) training for construction crews before construction activities begin. The WEAP training would include a brief review of the special-status species and other sensitive resources that could occur in the Proposed Project area (including their life history and habitat requirements and what portions of the Proposed Project area they may be found in) and their legal status and protection. The program would also cover all mitigation measures; environmental permits; and Proposed Project plans, such as the BMPs, erosion control and sediment plan, and any other required plans. During WEAP training, construction personnel would be informed of the importance of avoiding ground-disturbing activities outside of the designated work area. The designated environmental inspector would be responsible for ensuring that construction personnel adhere to the guidelines and restrictions. WEAP training sessions would be conducted as needed for new personnel brought on to the job during the construction period (relative to the area in which the employee would be working and the tasks the employee would be completing).
5	The DOGGR is responsible for wells drilled into an underground gas storage facility. SNGS, LLC would complete engineering and geology studies and an injection plan and submit them to DOGGR for approval. These studies would describe the well drilling and abandonment plans; reservoir characteristics; all geologic units, aquifers, and oil and gas zones; and the monitoring system to ensure that injected gas is confined to the intended zone. SNGS, LLC would be required to post a bond with DOGGR to ensure proper completion or abandonment of any well drilled. Additionally, DOGGR would be responsible for approving a water injection plan that would allow SNGS, LLC to inject water that is extracted from the gas field back into the gas field.
7	The following measures would be incorporated into the construction contract specifications to address hazardous materials generated from construction-related activities: • Diesel fuel and petroleum-based lubricants shall be stored only at designated staging areas. • Regardless of the quantity spilled, all hazardous material spills or threatened releases (including petroleum products such as gasoline, diesel, and hydraulic fluid) must be immediately reported if the spill has entered or threatens to enter a water of the State of California or the U.S., or has caused injury to a person or threatens injury to public health.
8	SNGS, LLC would prepare a Hazardous Materials Contingency Plan that would be implemented if a spill occurs or if any hazardous materials are encountered during construction. Provisions outlined in this plan would include phone numbers of city, county, state, and federal agencies and primary, secondary, and final cleanup procedures. In addition, SNGS, LLC would require the project contractor to prepare a Health and Safety Plan (HSP) to minimize environmental impacts in the event that hazardous soils or other materials are encountered during construction of the project. The HSP would include elements that establish worker training, engineering

Table D.7-3 (Continued)

APM No.	Description
	controls, and monitoring. The HSP also would establish security measures to prevent unauthorized entry to cleanup sites and to reduce hazards outside the investigation/cleanup area.
12	The equipment used for the Proposed Project would require periodic maintenance and refueling. To reduce the potential of contamination by spills, no refueling, storage, servicing, or maintenance of equipment would be performed within 100 feet of sensitive environmental resources (e.g., seasonal wetlands and Morrison Creek). Additionally, all refueling or servicing would be done with absorbent material or drip pans underneath equipment to contain spilled fuel or fluids. Any fluids drained from the machinery during servicing would be collected in leakproof containers and taken to an appropriate disposal or recycling facility. If such activities result in spillage or accumulation of a product on the soil, the contaminated soil would be assessed and disposed of properly. Under no circumstances would contaminated soils be added to a spoils pile. Mobile refueling trucks likely would be used for on-site refueling of stationary construction equipment. The refueling trucks would be independently licensed and regulated to haul and dispense fuels and to ensure that the appropriate spill prevention techniques are implemented. All maintenance materials (i.e., oils, grease, lubricants, antifreeze, and similar materials) would be stored in a designated storage area, away from site activities and more than 100 feet from sensitive resources. During construction, all vehicles and equipment required on site would be parked or stored at least 100 feet from waterbodies, wetlands, and other sensitive resource areas. These areas would be identified on the construction drawings, as appropriate. All wash-down activities would be conducted at least 100 feet from sensitive environmental resources.
13	Following installation of the pipeline, the right-of-way (ROW) would be graded to preconstruction grades and contours and would be seeded with an appropriate seed mix. The seed mix would be composed of the appropriate mix of species and be acceptable to the landowner. All disturbed areas of paved roadways would be repaved.
14	SNGS, LLC would prepare an erosion and sediment control plan and a post-construction erosion and sediment control plan that describes when, where, and how the site reclamation BMPs would be implemented. The City of Sacramento would review and approve these plans prior to construction.
16	SNGS, LLC would prepare a Bore Plan and Frac-Out Contingency Plan that would both reduce the potential for a frac-out to occur and minimize any negative impact should a frac-out occur. The plan will include specific measures for monitoring frac-out, containing drilling mud, and notifying agency personnel. The plan will be submitted to CPUC and agencies with jurisdiction prior to horizontal directional drilling (HDD) activities. The contractor will be responsible for hauling and the disposal of all waste drilling fluid at an approved location.

D.7.3.3 Hydrology and Water Quality Impact Analysis

Impact H-1: Water Quality Degradation from Erosion and Sedimentation during Construction

Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

Construction of the proposed facilities would require grading to provide level pad sites to support the construction of the wellhead site and compressor station. Grading activities would include conventional cut and fill techniques. The erosion potential for exposed soils within the sites during construction would be relatively low, considering the relatively flat nature of the sites. Construction of the proposed pipelines would require excavation of soils along the pipelines. The trenches would typically not be open for more than 3 days and would then be backfilled.

Even with slight relief, soil detachment, runoff, and subsequent sedimentation are possible. Similarly, wind erosion and sedimentation resulting from mud tracked onto roadways could occur. Sedimentation is considered a pollutant and can have adverse impacts to water quality resulting from increases in turbidity, nutrient loads, and aquatic habitat degradation.

SNGS, LLC has proposed APMs 1, 2, and 14 to reduce erosion and control sedimentation from construction. These measures require implementation of erosion and sediment BMPs; confining construction activities to well-defined work zones; avoidance of sensitive features, including adjacent waters and wetlands; and conducting a WEAP, which includes training on all mitigation measures; including BMPs; an erosion and sediment plan; and the covering of trucks hauling soils, sand, and other loose materials. Implementation of these APMs would protect water quality in the project area due to erosion from construction activities; therefore, this impact is considered less than significant (Class III; see Section D.1 for classification of impact significance), and no further mitigation is required.

Impact H-2: Degradation of Water Quality through Spill of Potentially Harmful Materials Used in Construction

Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

Accidental spills or release of potentially hazardous materials commonly used during construction could enter and pollute surface waters or groundwater. Hazardous materials anticipated to be used during construction include diesel fuel, gasoline, motor oil, hydraulic fluid, antifreeze, transmission fluid, lubricating grease, cement, paints, and solvents. The primary receiving waters for runoff from proposed construction activities, including the wellhead site, compressor station, and pipeline construction, include Morrison Creek, Elder Creek, the remnant Morrison Creek corridor, wetlands, other drainageways, the Sacramento Valley Groundwater Basin, and the South American Subbasin. SNGS, LLC has proposed APMs 7, 8, and 12 to reduce the potential for an inadvertent release and to provide guidelines for containing and cleaning up spills in the event that a hazardous material is released to the ground. The APMs require that hazardous materials be stored in designated storage areas; any refueling, service, and equipment maintenance activities occur at least 100 feet away from sensitive environmental resources; and any refueling, service, and equipment maintenance activities would be done with absorbent material or drip pan underneath equipment to contain spilled fuel or fluids. In addition, APM 8 requires development of a Hazardous Materials Contingency Plan and Health and Safety Plan for quick and safe cleanup of accidental spills occurring during construction. Implementation of these APMs would protect the water quality of both surface water and groundwater in the project area from accidental spills of hazardous materials occurring during construction. Therefore, this impact is considered less than significant (Class III), and no further mitigation is required.

Impact H-3: Impacts to Surface Waters

Wellhead Site and Compressor Station

As depicted on Figure D.7.1, there are no streams or creeks within the proposed wellhead, or compressor station, site limits. Therefore, there would be no direct impacts to surface waters at the project sites.

Pipeline Segments 1 and 2

Horizontal directional drilling (HDD) would be used to drill under Morrison Creek for pipeline segment one in order to avoid direct impacts to this resource area. Following completion of each drill, a steel or high density polyethylene pipe would be pulled back through the hole. HDD requires the use of bentonite, a naturally occurring clay, and non-toxic detergents (which together with water make up the drilling fluid or drilling mud) to keep the hole walls from collapsing and to carry drill cuttings back to a return pit. The drilling mud also provides lubrication for the drill head. It is possible for drilling mud to reach the earth's surface through cracks in bedrock or highly permeable soil horizons in the substrate's profile. This process is known as a "frac-out" and is often visible as a plume in a waterbody or on land in the vicinity of the drill. Operators of HDDs can identify frac-outs by a reduction in returns or a drop in drilling mud pressure. An inadvertent release of drilling mud (i.e., a frac-out) during the HDD under Morrison Creek could result in sedimentation and turbidity to nearby water resources and could ~~be~~ potentially mix with contaminated groundwater associated with groundwater remediation at Depot Park. With implementation of APMs 8 and 16 (which require preparation of a Hazardous Materials Contingency Plan, a Health and Safety Plan, an Emergency Response Plan, and a Bore Plan) and Mitigation Measures H-3a and H-3b, impacts to surface waters would be reduced to a less-than-significant level (Class II).

In addition, APM 13 requires that, following construction, the pipeline ROW be graded to pre-construction grades and contours and be revegetated with an appropriate seed mix, which would reduce impacts to surface water during operation to less than significant (Class III).

Mitigation Measures for Impact H-3: Impacts to Surface Waters

H-3a Creek Crossing Procedures. Creek crossings shall be conducted in a manner that does not result in a sediment-laden discharge or hazardous materials release to the waterbody. The following measures shall be implemented during horizontal boring (jack and bore) operations:

(1) Site preparation shall begin no more than 10 days prior to initiating horizontal bores to reduce the time soils are exposed adjacent to creeks and drainages.

(2) Trench and/or bore pit spoil shall be stored a minimum of 25 feet from the top of the bank or wetland/riparian boundary for Morrison Creek. Spoils shall be stored behind a sediment barrier and covered with plastic or otherwise stabilized (i.e., tackifiers, mulch, or detention).

(3) Portable pumps and stationary equipment located within 100 feet of a water resource (i.e., wetland/riparian boundary, creeks, drainages) shall be placed within secondary containment with adequate capacity to contain a spill (i.e., a pump with 10-gallon fuel or oil capacity should be placed in secondary containment capable of holding 15 gallons). A spill kit shall be maintained on site at all times.

(4) Immediately following backfill of the bore pits, disturbed soils shall be seeded and stabilized to prevent erosion and temporary sediment barriers left in place until restoration is deemed successful.

(5) SNGS, LLC shall obtain the required permits prior to conducting work associated with HDD activities and provide proof to CPUC. Required permits may include ACOE CWA Section 404, RWQCB CWA 401, and CDFG Streambed Alteration Agreement 1602. SNGS, LLC shall implement all pre- and post-construction conditions identified in the permits issued for HDD activities.

H-3b (1) Prior to construction, SNGS, LLC shall consult with the CVRWQCB to determine if an individual discharge permit is required for dewatering at any of the project sites anticipated to encounter groundwater. A copy of the permit or a waiver from the RWQCB, if required, shall be provided to the CPUC prior to dewatering.

(2) In addition, SNGS, LLC shall submit a typical dewatering drawing that shall be implemented during dewatering activities. The drawing shall include the location of pumps within secondary containment; fuel storage areas; anticipated discharge point; scour protection measures; intake hose screening; and monitoring procedures to ensure that hazardous materials spills are addressed in a timely manner and discharge hoses are frequently inspected for leaks.

Impact H-4: Increased Runoff from New Impervious Areas and Alteration of Existing Drainage Patterns

Wellhead Site and Compressor Station

Construction of the wellhead site would increase the impervious surface area by approximately 0.2 acre, resulting in an approximately 11% increase in runoff (SNGS, LLC 2007). The remaining approximately 3.8 acres would be covered with crushed rock, a pervious surface that would not impede infiltration of runoff. A 10-foot-high wall would surround and isolate the

wellhead site from runoff to and from the site, with the exception of a culvert from the Power Inn Road ditch, which will be in the developed portion of the wellhead site.

The wellhead site currently acts as a detention area for flows that run onto the site. Construction activities on site could change the current drainage patterns, which could contribute to off-site runoff to surrounding areas, which would be a potential significant impact. With implementation of Mitigation Measure H-4a, which requires preparation of a Drainage Study and Shed Map, impacts to drainage would be reduced to less than significant (Class II).

Construction of the compressor station would increase the impervious surface area and alter existing drainage patterns of the approximately 5-acre site. The impervious surface area would increase by approximately 1 acre, resulting in about 22% increase in runoff (SNGS, LLC 2007). Because 1 acre of impervious surface area will be added and on-site drainage patterns would be altered due to a new building on site, there could be a potential for a significant impact to runoff and changes to the existing drainage pattern on site. With implementation of Mitigation Measures H-4a and H-4b; which require preparation of a drainage study, shed map, and erosion and sediment control plans; impacts to increased runoff and drainage would be reduced to a less-than-significant level (Class II).

Pipeline Segments 1 and 2

Construction of the proposed pipelines would not result in increased runoff, as there are no impervious surfaces associated with installation of the pipelines. During construction, there could be a minor alteration of drainage patterns due to the spoils adjacent to the trenches; however, as installation of the pipelines is proposed during the dry season, and due to the temporary nature (approximately 3 days) of the areas being exposed, this is considered less than significant (Class III), and no mitigation is required.

After construction of the pipelines, excavated soils would be backfilled into the open trenches, and the area of potential effect would be graded to preconstruction grades and contours. Therefore, there would be no increased runoff or alteration of drainage patterns, and no long-term impacts would occur (Class III).

Mitigation Measures for Impact H-4: Increased Runoff from New Impervious Areas and Alteration of Existing Drainage Patterns

H-4a Drainage Study and Shed Map. SNGS, LLC shall prepare a drainage study and shed map as described in Section 11.7 of the City of Sacramento's Design and Procedures Manual. The drainage study shall include an overland flow release map for the Proposed Project. Sufficient off-site and on-site spot elevations shall be provided in the drainage study to determine the direction of the storm drain runoff. The Department of Utilities

shall approve this study and shed map. The on-site storm drain system shall be sized per the latest design runoff standards. Prior to design, SNGS, LLC will contact the Department of Utilities for the design criteria.

The building pad elevations for the wellhead and compressor station sites shall be approved by the Department of Utilities and shall be a minimum of 1.7 feet above the local controlling overland release elevation or the finished floor elevation, or the finished floor elevation shall be a minimum of 1.7 feet above the local controlling overland flow release elevation, whichever is higher.

H-4b Compliance with Grading, Erosion and Sediment Control Ordinance. SNGS, LLC shall comply with the City of Sacramento's Grading, Erosion, and Sediment Control Ordinance. This ordinance requires the applicant to prepare erosion and sediment control plans for both during and after construction of the Proposed Project and to prepare preliminary and final grading plans and plans to control urban runoff pollution from the project site during construction.

This project is greater than 1 acre in size; therefore, SNGS, LLC is required to comply with the state's NPDES General Permit for Stormwater Discharges Associated with Construction Activity (General Permit). To comply with the General Permit, SNGS, LLC will need to file an NOI with the SWRCB and prepare a SWPPP prior to construction. The SWPPP will be reviewed by the Department of Utilities prior to issuing a grading permit. The following items shall be included in the SWPPP: (1) vicinity map, (2) site map, (3) list of potential pollutant sources, (4) type and location of erosion and sediment BMPs, (5) name and phone number of person responsible for SWPPP, and (6) certification by property owner or authorized representative.

Impact H-5: Construction Impacts to Groundwater Disturbance and Water Quality Degradation

Wellhead Site

Drilling of the wells would use muds and other chemicals that could impact the quality of the aquifer. This would be in the initial placement of the casement into the cap rock. This impact is considered significant and can be reduced to less-than-significant levels (Class II) with implementation of Mitigation Measure H-5b and APM 7.

Compressor Station

Construction of the compressor station is not expected to impact groundwater since construction will be above groundwater levels (no impact).

Pipeline Segments 1 and 2

Construction of pipeline segments one and two may create potential significant impacts to groundwater during HDD of Morrison Creek. This drilling activity may encounter groundwater that would impact the shallow aquifer. This impact is considered significant (Class II). With implementation of Mitigation Measures H-3b and H-5c, these impacts can be reduced to less-than-significant levels through dewatering of the trenches and proper disposal of the water.

Mitigation Measures for Impact H-5: Construction Impacts to Groundwater Disturbance and Water Quality Degradation

H-5a Compliance with Regulations. SNGS, LLC and its contractors shall comply with all local, state, and federal regulations pertaining to stormwater and non-stormwater discharges.

H-5b Use of Non-Toxic Drilling Muds. SNGS, LLC and its contractors shall use non-toxic drilling muds during the drilling of the wells within the areas above the shale cap. Any contaminated drilling mud shall be disposed of at~~in~~ an approved facility.

H-5c Groundwater Procedures. If groundwater is encountered during the pipeline trenching or HDD, the site shall be dewatered prior to continuing construction. An NPDES permit shall be obtained for proper disposal of water. Treatment may be required prior to discharge.

Impact H-6: Encroachment into a Floodplain or Watercourse by Permanent Project Features

Wellhead Site and Compressor Station

The proposed wellhead site would be placed outside the FEMA 100-year floodplain and associated watercourses; therefore, there is no risk of exposing structures to flooding hazards or increase in flooding hazards.

As shown in Figure D.7-2, the western portion of the compressor station site is within the 100-year flood zone and could be exposed to flood waters. With inadequate drainage on site, this would be a significant impact to the compressor station. Implementation of Mitigation Measure H-4a, which requires preparation of a drainage study and shed map, would ensure adequate drainage on the compressor station site and reduce impacts to less than significant (Class II).

Pipeline Segments 1 and 2

The majority of pipeline segment one would be placed outside the 100-year floodplain; therefore, there is no risk of exposing structures to flooding hazards or increase in flooding hazards in this

section of pipeline segment one. The HDD segment under Morrison Creek would be at least 80 feet below the ground surface. As discussed under Impact H-3, less-than-significant impacts (Class III) to local surface water hydrology and drainage are anticipated due to proposed horizontal boring or HDD.

The proposed pipeline segment two and a portion of segment one would be within the FEMA 100-year flood zone (see Figure D.7-2). As proposed, pipeline segment two would be at least 6 feet below the ground surface. As discussed under Impact H-3, less-than-significant impacts (Class III) to local surface water hydrology and drainage are anticipated due to proposed trenching, horizontal boring, or HDD.

Impact H-7: Construction in a Potential Dam Inundation Area

Wellhead Site and Compressor Station

The unlikely event of a dam failure could result in a dam-inundation floodplain and could cause severe flooding and damage to structures located within the inundation zone. The proposed wellhead site and compressor station sites could be affected by a dam failure. However, since the risk of dam inundation and resulting adverse environmental consequences is considered low, this impact would be considered less than significant (Class III).

Pipeline Segments 1 and 2

The unlikely event of a dam failure could result in a dam-inundation floodplain and could cause severe flooding and damage to structures located within the inundation zone. The project pipeline segments could be affected by a dam failure. However, since they are located underground and would not be substantially affected by flooding, and since the risk of dam inundation and resulting adverse environmental consequences is considered low, this impact would be considered less than significant (Class III).

Impact H-8: Operation and Maintenance Impacts to Surface Water and Groundwater Quality

Natural Gas Field, Wellhead Site, and Compressor Station

Operations and maintenance of the proposed wellhead site and compressor station would entail periodic ground checks and routine repairs of the equipment. The equipment of the wellhead site would be accessed on paved or gravel roads within the walls of the wellhead site, and no impacts to surface water would occur. Equipment for the compressor station would be inside a structure, and no impacts to surface water would occur.

Implementation of the Proposed Project will present the potential of contamination of the groundwater aquifer through the storage of natural gas. Of concern would be the contamination

of the aquifer through migration of gas into the aquifer. A detailed discussion of the potential for the stored natural gas to seep into the aquifer and to the surface is provided in Section D.6, Hazardous Materials, Public Health and Safety (Impact HAZ-2a). This section summarizes the conclusions in that analysis and focuses the impacts toward water quality.

Natural gas can enter the aquifer through migration of gas through faults or other discontinuities in the cap rock or through an abandoned or operating well that is not properly sealed. An analysis by Ryder Scott Company (2008) based on reservoir computer modeling, has concluded that pressure within the gas field may exceed pressures of the original gas fields by almost 8% at some locations. This pressure would be a cyclic event as gas is injected and taken out of the storage facility. In testimony to the CPUC, Bruce Palmer of the Ryder Scott Company indicated that standard industry practice is that gas reservoir caps can withstand 10% overpressure above the original reservoir without substantial risk of gas leakage (Palmer 2008). Existing data from previous drilling at Florin Gas Field does not include laboratory data. Also, the analysis did not address the impacts of recycling of gas pressures associated with the operation of the gas storage facility. There is sufficient evidence to conclude that the leakage of gas into the overlying groundwater aquifer is unlikely to occur. However, there is insufficient information to conclude categorically that gas migration to the overlying aquifer would not occur. Therefore, it is assumed that there is a low potential that gas could migrate into the aquifer; however, should this migration occur, the gas could contaminate the aquifer. This contamination could be substantial requiring a prolonged period of remediation and impacting the water quality of a major potable aquifer. This is considered a significant and unavoidable impact (Class I) even with the implementation of Mitigation Measures H-8b and HAZ-2a*i*, due to the consequence if it were to occur and the difficulty of remediating the contamination.

There is a potential that new and previously abandoned wells could leak natural gas into the aquifer. The abandoned wells have been sealed into the cap rock according to requirements of ~~the~~ DOGGR, and DOGGR will reevaluate the existing wells and take any action as to additional modifications to these wells; therefore, the failure of these abandoned wells is remote and less than significant (Class III). The new wells will be constructed under the supervision of DOGGR. Each well will be drilled to approximately 100 feet below the freshwater table and a casement will be placed and cemented back to the surface. The well will then be completed through the cap rock and a casement again placed and cemented through the cap rock. This would effectively block any migration of gas into the aquifer and is considered less than significant (Class III). In addition, APM 5 requires SNGS, LLC to complete engineering and geology studies and an injection plan and submit them to DOGGR for approval. These studies would describe the well drilling and abandonment plans; reservoir characteristics; all geologic units, aquifers, and oil and gas zones; and the monitoring system to ensure that injected gas is confined to the intended zone.

Pipeline Segments 1 and 2

Operation of the pipelines is not expected to have impacts to hydrology and water quality. Maintenance will generally be limited to use of smart pigs for pipeline inspection, which would not create water quality impacts.

Mitigation Measures for Impact H-8: Operation and Maintenance Impacts to Surface Water and Groundwater Quality

H-8a Spill Prevention, Control, and Countermeasure Plan. SNGS, LLC shall prepare a Spill Prevention, Control, and Countermeasure (SPCC) Plan in accordance with 40 CFR 112. A copy of the plan shall be submitted to the CPUC prior to project start-up. This plan shall include methods for erosion control, control and use of hazardous materials, location of fueling, and other protection methods.

H-8b Groundwater Monitoring Wells. SNGS, LLC shall develop groundwater monitoring wells at the wellhead site. These should be in place and a groundwater quality baseline developed prior to any drilling activities. Groundwater quality shall be monitored in both the shallow and deeper aquifers. In the event that hydrocarbon levels above baseline are detected, gas storage activities shall be suspended and the reservoir allowed to depressurize until the source of this contamination is found and corrected. Remediation may also be required if hydrocarbons contaminate the water column. Potential remediation methods shall also be identified. Because the duration of this impact and the effectiveness of this mitigation measure—specifically remediation, if required—are not known, the impact remains significant and unavoidable. The plan shall be reviewed by both DOGGR and the RWQCB.

D.7.4 Project Alternatives

D.7.4.1 Gas Field Alternatives

Freeport Gas Field

Environmental Setting

The Freeport Gas Field alternative site is located in a suburban fringe area and is partially located underneath a wastewater treatment plant (Figure C-2). The area is surrounded on the north, west, and south by the City of Elk Grove (population 59,984) (U.S. Census 2000). Beach Lake is located approximately 1.5 miles northwest of the northern boundary of Freeport Gas Field. East Lake and West Lake are located approximately 1 mile south of the gas field southern boundary, south of Laguna Boulevard. In addition, an unnamed waterbody is located to the north of the middle of the gas field boundary. The Folsom Dam is located approximately 24 miles northeast

of the gas field. The site is within the Sacramento River Groundwater Basin, near the boundary of Yolo and South American Subbasin. The site is relatively flat with little topographic relief.

Environmental Impacts and Mitigation Measures

Construction-related wind and water erosion on the wellhead site and the compressor station would be similar to the Proposed Project if those structures are built on undeveloped land within this alternative site (Impact H-1). Implementation of APMs 1, 2, and 14 would reduce construction-related wind and water erosion and would protect water quality in the project area due to erosion from construction activities for all three facilities; therefore, this impact is considered less than significant (Class III). In addition, impacts to the absorption rate, drainage patterns, and the rate and amount of surface water runoff are anticipated to be similar to those of the Proposed Project (Impact H-4) and would be less than significant with implementation of Mitigation Measures H-4a through H-4b (Class II).

Accidental hazardous material spills would lead to similar surface water quality degradation (Impact H-2), as both this project site and the Proposed Project are near urban development. APMs 7 and 8 would reduce impacts resulting from accidental spills of hazardous materials (Impact H-2) to less than significant (Class III); therefore, no further mitigation is required.

The Freeport Gas Field boundary is near several open waterbodies, including Beach Lake to the northwest, East Lake and West Lake to the south within the developed community, and an unnamed waterbody to the north of the middle of the gas field (Figure C-2). The aboveground structural facilities should be developed away from these areas to avoid direct construction-related impacts to the surface waters of these waterways (Impact H-3). As with the Proposed Project, drilling would be used for the wellhead site component of the project. An inadvertent release of drilling mud (frac-out) during HDD drilling could result in sedimentation and turbidity to nearby water resources. With implementation of APMs 8 and 16, which require preparation of a Hazardous Materials Contingency Plan, a Health and Safety Plan, and a Bore Plan, and Mitigation Measure H-3a, impacts to surface waters would be reduced to a less-than-significant level (Class II).

Construction of pipelines would have the potential to require dewatering since some areas would have shallow groundwater (Impact H-5). With implementation of Mitigation Measures H-3b and H-5c, these impacts would be reduced to less-than-significant levels through dewatering of the trenches and proper disposal of the water (Class II).

A portion of the site is within the 100-year floodplain (Impact H-6). Structures could be exposed to flood waters if placed within this boundary, which would be a significant impact. However,

with implementation of the Mitigation Measure H-4, these impacts would be less than significant (Class II).

As with the Proposed Project, this alternative could be affected by dam inundation in the event of dam failure (Impact H-7). However, since the risk of dam inundation and resulting adverse environmental consequences is considered low, this impact would be considered less than significant (Class III).

Implementation of the alternative would result in the potential for leakage of natural gas into the aquifer (Impact H-8) that had beneficial uses including drinking water and irrigation. As with the Proposed Project, this is considered a significant and unavoidable impact (Class I). Although contamination could occur, fewer people would rely on the drinking water as for the Proposed Project area.

Comparison to the Proposed Project

Since this alternative is located within the San Joaquin Delta Region and several waterways are in the vicinity of the gas field, it would have greater impacts than the Proposed Project to hydrology and water quality. Development of the Freeport Gas Field Alternative project site would involve grading and minor topography changes, as well as creation of impermeable surfaces in the form of the wellhead site and compressor station facilities. As with the Proposed Project, pipelines would be underground, and with implementation of Proposed Project mitigation measures, impacts would be less than significant (Class III). Impact on absorption rates, drainage patterns, and the rate and amount of surface water runoff are anticipated to be similar to those identified for the Proposed Project (Class II).

In a 100-year flood event, this alternative would pose a higher risk to the project facilities than the Proposed Project; however, as with the Proposed Project, Mitigation Measure H-4 would reduce this impact to less than significant (Class II). In the event of a dam failure, this alternative would pose potential hazards related to flooding similar to those identified for the Proposed Project (Class III). During operation, this project would have the potential to impact the groundwater quality through natural gas migration, which is significant and unavoidable (Class I). Although contamination of the aquifer could occur, when compared to the Proposed Project, the aquifer at this alternative site would not be a source of drinking water for a large population, and it would be easier to provide an alternative drinking supply.

Snodgrass Slough Gas Field

Environmental Setting

The Snodgrass Slough Gas Field alternative site is a former gas field that is located in a primarily agricultural area (Figure C-3). It is located within the San Joaquin Delta Region, with Stone Lake

located approximately 5 miles to the northeast, the Sacramento River approximately 3 miles to the west, and Reclamation District 551 Borrow Canal adjacent to and immediately east of the site. Folsom Dam is located approximately 34 miles northeast of the gas field. The site is within the Sacramento River Groundwater Basin, on the border of the Yolo and South American Subbasins**.** The site is flat with little topographical relief. Since it is an existing agricultural area, there are no impervious surface areas on site.

Environmental Impacts and Mitigation Measures

Construction-related wind and water erosion on the wellhead site and the compressor station would be similar to the Proposed Project, as those sites and the alternative project site are currently undeveloped parcels (Impact H-1). Implementation of APMs 1, 2, and 14 would reduce construction-related wind and water erosion and would protect water quality in the project area due to erosion from construction activities for these facilities; therefore, this impact is considered less than significant (Class III). In addition, impacts to the absorption rate, drainage patterns, and the rate and amount of surface water runoff are anticipated to be similar to those of the Proposed Project (Impact H-4) and would be less than significant with implementation of Mitigation Measure H-4 (Class II).

Accidental hazardous material spills could lead to greater surface water quality degradation (Impact H-2) due to the undeveloped nature of the alternative site area and lack of a drainage system. APMs 7 and 8 would reduce impacts resulting from accidental spills of hazardous materials (Impact H-2) to less than significant (Class III); therefore, no further mitigation is required.

The Snodgrass Slough gas field boundary, as shown in Figure C-3, is under the Reclamation District 551 Borrow Canal. The project structural facilities should be developed away from this area to avoid direct impacts to the canal to avoid impacts to surface waters from construction activity (Impact H-3). As with the Proposed Project, drilling would be used for the wellhead site and the HDD component of the project. An inadvertent release of drilling mud (frac-out) during the HDD under the slough could result in sedimentation and turbidity to nearby water resources. With implementation of APMs 8 and 16, which require preparation of a Hazardous Materials Contingency Plan, Health and Safety Plan, and a Bore Plan, and Mitigation Measure H-3, impacts to surface waters would be reduced to a less-than-significant level (Class II).

Implementation of the Proposed Project may require dewatering in some areas of pipeline construction (Impact H-5). As with the Proposed Project, the drilling of gas wells would have a potential to impact the groundwater aquifer (Class II). With implementation of Mitigation Measures H-3b, H-5b, and H-5c, these impacts would be reduced to less-than-significant levels through dewatering of the trenches and proper disposal of the water.

The eastern portion of the Snodgrass Slough site is within the 100-year floodplain (Impact H-6). If structures are constructed in this area, they could be exposed to flood waters, and this would be a significant impact. To reduce impacts of flooding of aboveground structures, this alternative should attempt to build structures on the western boundary of the site. This would reduce flooding impacts to less than significant (Class II).

As with the Proposed Project, Snodgrass Slough could be affected by dam inundation in the event of a dam failure (Impact H-7). However, since the risk of dam inundation is considered low, and resulting adverse environmental consequences low, this impact would be considered less than significant (Class III).

During operation of the project (Impact H-8), this alternative would result in the potential for leakage of natural gas into the aquifer that had beneficial uses, including drinking water and irrigation. As with the Proposed Project, this is considered a significant and unavoidable impact (Class I). Although contamination could occur, fewer people would rely on the drinking water as for the Proposed Project area.

Comparison to the Proposed Project

Since this alternative is located within the San Joaquin Delta Region and several waterways are in the vicinity of the gas field, it would have greater impacts than the Proposed Project to hydrology and water quality. Development of the Snodgrass Slough Gas Field alternative site would involve grading and minor topography changes, as well as creation of impermeable surfaces in the form of the wellhead site and compressor station facilities. As with the Proposed Project, pipelines would be underground, and with implementation of Proposed Project mitigation measures, impacts would be less than significant (Class III). Impact on absorption rates, drainage patterns, and the rate and amount of surface water runoff are anticipated to be similar to those identified for the Proposed Project (Class II).

In the event of a dam failure or a 100-year flood, this alternative would pose potential hazards related to flooding similar to those identified for the Proposed Project (Class III). During operation, this project would have the potential to impact the groundwater quality through natural gas migration, which is significant and unavoidable (Class I). Although contamination of the aquifer could occur, when compared to the Proposed Project, the aquifer at this alternative site would not be a source of drinking water for a large population, and it would be easier to provide an alternative drinking supply.

Thornton Gas Field

Environmental Setting

The Thornton Gas Field alternative site is located in a primarily agricultural area (Figure C-4). The nearest population center is Thornton (population 4,650), approximately 1 mile to the south (U.S. Census 2000). The site is relatively flat with little topographic relief. Since it is an existing agricultural area, there are no impervious surface areas on site. To the north of the site is the Cosumnes River Preserve. The gas field is located under several waterways, including the Cosumnes River, the Mokelumne River, and the Grizzly Slough. There are several dams that could potentially affect the site should a rupture occur, including Folsom Dam, Jackson Creek Dam, Nimbus Dam, Pardee Dam, Salt Springs Dam, and Slypark Dam (OES 2006). The site is within the San Joaquin Valley Groundwater Basin, Cosumnes Subbasin.

Environmental Impacts and Mitigation Measures

Construction-related wind and water erosion on the wellhead site and the compressor station would be similar to the Proposed Project, as those sites and the alternative project site are currently undeveloped parcels (Impact H-1). Implementation of APMs 1, 2, and 14 would reduce construction-related wind and water erosion and would protect water quality in the project area due to erosion from construction activities for these facilities; therefore, this impact is considered less than significant (Class III). In addition, impacts to the absorption rate, drainage patterns, and the rate and amount of surface water runoff are anticipated to be similar to those of the Proposed Project (Impact H-4) and would be less than significant with implementation of Mitigation Measure H-4 (Class II).

Accidental hazardous material spills could lead to greater surface water quality degradation (Impact H-2) due to the undeveloped nature of the alternative site area and lack of a drainage system. APMs 7 and 8 would reduce impacts resulting from accidental spills of hazardous materials (Impact H-2) to less than significant (Class III); therefore, no further mitigation is required.

The Thornton Gas Field boundary (Figure C-4) is under the Cosumnes River, the Mokelumne River, and the Grizzly Slough. The project structural facilities should be developed away from these areas to avoid direct construction-related impacts to the surface waters of these waterways (Impact H-3). As with the Proposed Project, drilling would be used for the wellhead site component of the project. An inadvertent release of drilling mud (frac-out) during HDD drilling could result in sedimentation and turbidity to nearby water resources. With implementation of APMs 8 and 16, which require preparation of a Hazardous Materials Contingency Plan, Health and Safety Plan, and a Bore Plan, and Mitigation Measures H-3a and H-3b, impacts to surface waters would be reduced to a less-than-significant level (Class II).

As with the Proposed Project, construction of the pipelines in some areas may require dewatering (Impact H-5). The drilling of gas wells would have a potential to impact the groundwater aquifer. However, with implementation of Mitigation Measures H-3b, H-5b, and H-5c these impacts would be reduced to less-than-significant levels through dewatering of the trenches and proper disposal of the water (Class II).

The entire site is within the 100-year floodplain (Impact H-6). Structures would be exposed to flood waters, and this would be a significant impact. However, with implementation of Mitigation Measure H-4, these impacts would be less than significant (Class II).

This alternative is in the dam inundation of several dams:

- Folsom Dam, 34 miles northeast
- Jackson Creek Dam, 28 miles east
- Nimbus Dam, 28 miles northeast
- Pardee Dam, 30 miles east
- Salt Springs Dam, 67 miles east
- Slypark, 56 miles northeast.

Similar to the Proposed Project, there is a risk of dam inundation at this site in the event of dam failure (Impact H-7). However, since the risk of dam inundation and resulting adverse environmental consequences is considered low, this impact would be considered less than significant (Class III).

During operation of the project (Impact H-8), this alternative would result in the potential for leakage of natural gas into the aquifer that had beneficial uses, including drinking water and irrigation. As with the Proposed Project, this is considered a significant and unavoidable impact (Class I). Although contamination could occur, fewer people would rely on the drinking water as for the Proposed Project area.

Comparison to the Proposed Project

Since this alternative is located within the San Joaquin Delta Region and several waterways are in the vicinity of the gas field, this alternative would have greater impacts than the Proposed Project to hydrology and water quality. Development of the Thornton Gas Field Alternative project site would involve grading and minor topography changes, as well as creation of impermeable surfaces in the form of the wellhead site and compressor station facilities. As with the Proposed Project, pipelines would be underground, and with implementation of Proposed Project mitigation measures, impacts would be less than significant (Class III). Impact on

absorption rates, drainage patterns, and the rate and amount of surface water runoff are anticipated to be similar to those identified for the Proposed Project (Class II).

In a 100-year flood, this alternative would pose a higher risk to the project facilities than the Proposed Project. In the event of a dam failure, this alternative would pose potential hazards related to flooding similar to those identified for the Proposed Project. During operation, this project would have the potential to impact the groundwater quality through natural gas migration, which is significant and unavoidable (Class I). Although contamination of the aquifer could occur, when compared to the Proposed Project, the aquifer at this alternative site would not be a source of drinking water for a large population, and it would be easier to provide an alternative drinking supply.

D.7.4.2 Project Design Alternatives

Environmental Setting

Section D.7.1 describes the hydrology and water quality setting along the project alignments. Because SNGS, LLC's design alternatives would occur in the same hydrologic area and within the same vicinity as the Proposed Project, the existing hydrologic conditions would be the same for all three of the gas pipeline route alternatives.

Alternative Wellhead Site to Compressor Station Pipeline Route 1

Environmental Impacts and Mitigation Measures

This alternative route would be approximately 7,800 feet long, approximately 450 feet longer than the Proposed Project. As with the Proposed Project, installation of the proposed pipeline route would require soil excavation along the alignment. The trenches would typically not be open for more than 3 days and would then be backfilled. The additional construction of the longer alignment would increase effects of construction-related water quality degradation and accidental spills of hazardous materials (Impacts H-1 and H-2) described in Section D.7.3. APMs 1, 2, 3, and 14 would reduce impacts to erosion and sedimentation (Impact H-1) to less than significant (Class III); therefore, no further mitigation is required. APMs 7, 8, and 9 would reduce impacts resulting from accidental spills of hazardous materials (Impact H-2) to less than significant (Class III); therefore, no further mitigation is required.

Potential impacts to surface waters would be unchanged from those described for the Proposed Project for the new alignment of the pipeline (Impact H-3). The new portion of the pipeline would be installed through a trenching method and would be a minimum of 6 feet below the surface. The HDD portion of this alignment under Morrison Creek would remain the same as the Proposed Project. These impacts would be reduced to a less-than-significant level with implementation of APMs 8, 9, and 16 and Mitigation Measures H-3a and H-5b (Class II).

The additional 450 feet of pipeline would have no impact on impervious surfaces (Impact H-4), since all work areas used for pipeline installation would be restored to preconstruction conditions and no additional aboveground facilities would be required.

This alternative would be similar to the Proposed Project in that it may require dewatering in some areas of pipeline construction (Impact H-5). Impacts due to drilling of gas wells would be the same as the Proposed Project (Class II). With implementation of Mitigation Measures H-3b and H-5b, these impacts would be reduced to less-than-significant levels through dewatering of the trenches and proper disposal of the water.

As with the Proposed Project, the pipeline will be placed a minimum of 6 feet underground and, therefore, there is no risk of exposing structures to flooding hazards or increase in flooding hazards (Impact H-6). In addition, as with the Proposed Project, this alignment would be within the 100-year floodplain and would be in an area potentially affected by dam inundation (Impact H-7). However, since the pipeline would be located underground and would not be substantially affected by flooding and the risk of dam inundation is considered low, this impact would be considered less than significant (Class III).

As with the Proposed Project, during operation (Impact H-8) of this alternative, the potential exists for contamination of the aquifer through migration of gas into the aquifer. The likelihood of this to occur is considered low; however, it is considered significant and unavoidable (Class I). Maintenance will generally be limited to use of smart pigs for pipeline inspection, which would not create water quality impacts.

Comparison to the Proposed Project

Because this alternative would require approximately 450 feet more trenching for installation of the pipeline, additional workspace would be exposed to wind and water erosion for a greater period of time (Impact H-1). In addition, this longer construction time increases the possibility for accidental spills of hazardous materials from construction equipment (Impact H-2). As with the Proposed Project, construction would occur during the dry season and the trenches would remain open for a maximum of 3 days. With these project construction requirements, along with implementation of APMs 1, 2, 3, 7, 8, 9, and 14, impacts would be less than significant (Class II).

Impacts to surface water and impervious surface area (Impacts H-3 through H-4) resulting from the alternative pipeline alignment are anticipated be similar to the Proposed Project. Therefore, any change in impacts to surface water quality resulting from implementation of this alternative would be considered negligible.

Impacts with regard to groundwater (Impact H-5) are similar to the Proposed Project; with implementation of mitigation measures, impacts are reduced to less than significant (Class II). Impacts resulting from flooding (Impact H-6) and related to dam inundation (Impact H-7) would be similar to impacts for the Proposed Project, which would be less than significant and require no mitigation (Class III). Operation of this alternative (Impact H-8) would be the same as of the Proposed Project, which is considered significant and unavoidable (Class I), due to the unlikely potential of gas migration contaminating the aquifer.

Alternative Wellhead Site to Compressor Station Pipeline Route 2

Environmental Impacts and Mitigation Measures

This alternative route would be approximately 7,700 feet long, approximately 350 feet longer than the Proposed Project. As with the Proposed Project, installation of the proposed pipeline route would require soil excavation along the alignment. The trenches would typically not be open for more than 3 days and would then be backfilled. The additional construction of the slightly longer alignment would increase the effects of construction-related water quality degradation and accidental spills of hazardous materials (Impacts H-1 and H-2) described in Section D.7.3. APMs 1, 2, 3, and 14 would reduce impacts to erosion and sedimentation (Impact H-1) to less than significant (Class III); therefore, no further mitigation is required. APMs 7, 8, and 9 would reduce impacts resulting from accidental spills of hazardous materials (Impact H-2) to less than significant (Class III); therefore, no further mitigation is required.

Potential impacts to surface waters would be unchanged from those described for the Proposed Project for the new alignment of the pipeline (Impact H-3). The new portion of the pipeline would be installed through a trenching method and would be a minimum of 6 feet below the surface. The HDD portion of this alignment under Morrison Creek would remain the same as the Proposed Project. These impacts would be reduced to a less-than-significant level with implementation of APMs 8, 9, and 16 and Mitigation Measures H-3b and H-5b (Class II).

The additional 450 feet of pipeline would have no impact on impervious surfaces (Impact H-4), since all work areas used for pipeline installation would be restored to preconstruction conditions and no additional aboveground facilities would be required.

This alternative would be similar to the Proposed Project in that it may require dewatering in some areas of pipeline construction (Impact H-5). Impacts due to drilling of gas wells would be the same as the Proposed Project (Class II). With implementation of Mitigation Measures H-3b and H-5b, these impacts would be reduced to less-than-significant levels through dewatering of the trenches and proper disposal of the water.

As with the Proposed Project, the pipeline will be placed a minimum of 6 feet underground; therefore, there is no risk of exposing structures to flooding hazards or increase in flooding hazards (Impact H-6). In addition, as with the Proposed Project, this alignment would be within the 100-year floodplain and would be in an area potentially affected by dam inundation (Impact H-7). However, since the pipeline would be located underground and would not be substantially affected by flooding, and since the risk of dam inundation is considered low, this impact would be considered less than significant (Class III).

As with the Proposed Project, during operation of this alternative (Impact H-8) the potential exists for contamination of the aquifer through migration of gas into the aquifer. The likelihood of this to occur is considered low; however, it is considered significant and unavoidable (Class I). Maintenance will generally be limited to use of smart pigs for pipeline inspection, which would not create water quality impacts.

Comparison to the Proposed Project

Because this alternative would require approximately 350 feet more trenching for installation of the pipeline, additional workspace would be exposed to wind and water erosion for a greater period of time (Impact H-1). In addition, this longer construction time increases the possibility for accidental spills of hazardous materials from construction equipment (Impact H-2). As with the Proposed Project, construction would occur during the dry season, and the trenches would only remain open for a maximum of 3 days. With these project construction requirements, along with implementation of APMs 1, 2, 3, 7, 8, 9, and 14, impacts would be less than significant (Class III).

Impacts to surface water, impervious surface area, and groundwater (Impacts H-3, H-4, and H-5) resulting from the alternative pipeline alignment are anticipated be similar to the Proposed Project. Therefore, any change in impacts to surface water quality and groundwater resulting from implementation of this alternative would be considered negligible.

Impacts resulting from flooding (Impact H-6) and impacts related to dam inundation (Impact H-7) would be the same as those of the Proposed Project, which were determined to be less than significant and requiring no mitigation (Class III). Impacts resulting from operation of this alternative (Impact H-8) would be the same as those of the Proposed Project, which is considered significant and unavoidable (Class I), due to the unlikely potential of gas migration contaminating the aquifer.

Alternative Wellhead Site to Compressor Station Pipeline Route 3

Environmental Impacts and Mitigation Measures

This alternative route would be approximately 7,100 feet long, approximately 250 feet shorter than the Proposed Project. As with the Proposed Project, installation of the proposed pipeline route would require soil excavation along the alignment. Since this alternative route is shorter, it would incrementally reduce the potential for construction-related effects to wind and water erosion and also to the chance of accidental spills of hazardous materials (Impacts H-1 and H-2) described in Section D.7.3. APMs 1, 2, 3 and 14 would reduce impacts to erosion and sedimentation (Impact H-1) to less than significant (Class III); therefore, no further mitigation is required. APMs 7, 8, and 9 would reduce impacts resulting from accidental spills of hazardous materials along the alignment (Impact H-2) to less than significant (Class III); therefore, no further mitigation is required.

Potential impacts to surface waters would be unchanged from those described for the Proposed Project for the new alignment of Alternative Wellhead Site to Compressor Station Pipeline Route 3 (Impact H-3). The new portion of the pipeline would be installed through a trenching method and would be a minimum of 6 feet below the surface. The HDD portion of this alignment under Morrison Creek would remain the same as the Proposed Project. These impacts were determined to be reduced to a less-than-significant level with implementation of APMs 8, 9, and 16 and Mitigation Measures H-3a and H-5c (Class II).

The shorter pipeline route would have no impact on impervious surfaces (Impact H-4), since all work areas used for pipeline installation would be restored to preconstruction conditions and no additional aboveground facilities would be required.

Impacts with regard to groundwater (Impact H-5) are similar to the Proposed Project; with implementation of mitigation measures, impacts are reduced to less than significant (Class II). As with the Proposed Project, the pipeline will be placed a minimum of 6 feet underground and therefore, there is no risk of exposing structures to flooding hazards or increase in flooding hazards (Impact H-6). In addition, as with the Proposed Project, this alignment would be within the 100-year floodplain and would be in an area potentially affected by dam inundation (Impact H-7). However, since the pipeline would be located underground and would not be substantially affected by flooding, and since the risk of dam inundation is considered low, this impact would be considered less than significant (Class III).

As with the Proposed Project, during operation of this alternative (Impact H-8) the potential exists for contamination of the aquifer through migration of gas into the aquifer. The likelihood of this to occur is considered low; however, it is considered significant and unavoidable

(Class I). Maintenance will generally be limited to use of smart pigs for pipeline inspection, which would not create water quality impacts.

Comparison to the Proposed Project

This alternative would be 250 feet shorter than the Proposed Project; therefore, there would be fewer effects to construction-related wind and water erosion (Impact H-1). In addition, due to shorter construction time, the possibility for accidental spills of hazardous materials from construction equipment is reduced with this alternative (Impact H-2). Impacts to surface water, impervious surface area, and groundwater (Impacts H-3, H-4, and H-5) resulting from the alternative are anticipated be similar to the Proposed Project. Therefore, any change in impacts to surface water quality and groundwater resulting from implementation of this alternative would be considered minimal.

Impacts resulting from flooding (Impact H-6) and impacts related to dam inundation (Impact H-7) would be the same as impacts for the Proposed Project, which were determined to be less than significant and require no mitigation (Class III). Impacts resulting from operation of this alternative (Impact H-8) would be the same as for the Proposed Project, which is considered significant and unavoidable (Class I), due to the unlikely potential of gas migration contaminating the aquifer.

D.7.4.3 Environmental Impact of the No Project Alternative

Under the No Project Alternative, none of the facilities associated with the project or alternatives evaluated in this Environmental Impact Report (EIR) would be developed and, therefore, none of the hydrology and water quality impacts as described in this section would occur. With implementation of the No Project Alternative, in the event of disruption of the Pacific Gas and Electric (PG&E) natural gas pipelines 400/401, SMUD may be required to implement cutbacks on non-essential energy use and may run out of natural gas at some locations.

D.7.5 Mitigation Monitoring, Compliance, and Reporting

Table G-1 discusses the mitigation monitoring, compliance, and reporting program for hydrology and water quality. CPUC shall be responsible for ensuring compliance with the provisions of this mitigation monitoring program. In addition, the RWQCB may elect to enforce mitigation measures under their jurisdiction at any point during the project.

D.7.6 References

14 CCR 1712 et seq. Development, Regulation, and Conservation of Oil and Gas Resources.

14 CCR 15000 et seq. CEQA (California Environmental Quality Act) Guidelines.

40 CFR 112. Spill Prevention, Control, and Countermeasure Plan.

40 CFR 142–144. National Primary Drinking Water Regulations Implementation; National Secondary Drinking Water Regulations; Underground Injection Control Program.

33 U.S.C. §403. Rivers and Harbors Act of 1899. Section 10.

33 U.S.C. §1251 et seq. Federal Water Pollution Control Act (Clean Water Act (CWA)).

42 U.S.C. §201. 1974. Safe Drinking Water Act. Amended 1986 and 1996.

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