CHAPTER 1
Introduction

This environmental document is a joint Draft Environmental Impact Statement and Draft Environmental Impact Report (Draft EIS/EIR). The Draft EIS/EIR was prepared to meet the requirements of the National Environmental Policy Act (NEPA; 42 USC 4321 *et seq*.) and the California Environmental Quality Act (CEQA; Public Resources Code 2100-21178.1). This Draft EIS/EIR describes and evaluates the environmental impacts that are expected to result from construction, operation, maintenance and decommissioning of the Casa Diablo IV Geothermal Development Project (CD-IV Project or Proposed Action) and presents recommended mitigation measures that, if adopted, would avoid, minimize or mitigate the environmental impacts identified. In accordance with NEPA and CEQA requirements, this Draft EIS/EIR also identifies alternatives that respond to the stated purpose and need for the Proposed Action that could avoid or minimize environmental impacts associated with the Proposed Action, and evaluates the environmental impacts associated with these alternatives.

1.1 Project Overview

On February 17, 2010, Mammoth Pacific, L.P. (MPLP) submitted an application to the United States Department of the Interior (DOI), Bureau of Land Management (BLM) to construct, operate, and following the expected 30-year useful life, decommission the CD-IV Project. As described in the “Application for Geothermal Drilling, Commercial Use, Site License, and Construction Permit; Plan of Development (POD), Plan of Operation and Plan of Utilization (POU)” (MPLP, 2010), the CD-IV Project is located in the vicinity of the existing Casa Diablo geothermal complex. Since the time the application was filed, MPLP was acquired by Ormat Nevada Inc., which has formed a wholly owned subsidiary (ORNI 50, LLC) to implement the CD-IV Project. Hereafter, the project Applicant will be referred to as ORNI 50, LLC.

On June 5, 2012, ORNI 50, LLC submitted an updated application to reflect changes in the proposed project. With the objective of further developing the geothermal resources at Casa Diablo to produce electricity from clean and renewable resources, and thereby supporting California and the nation’s mission to reduce dependency on fossil fuels, the CD-IV Project would construct a new 33 net megawatt (MW) binary power plant composed of two (2) Ormat Energy Converters (OECs); develop an expanded geothermal well field; construct pipelines to bring the geothermal brine to the power plant and pipelines to take the cooled brine to injection wells; and, install an electric transmission line to interconnect to the Southern California Edison (SCE) Substation at Substation Road. In addition to the BLM permit, the CD-IV Project requires discretionary permits from the United States Forest Service (USFS), Inyo National Forest, and the Great Basin Unified Air Pollution Control District (GBUAPCD) as described in Section 1.2.

The CD-IV Project power plant would be located on National Forest System lands administered by the Inyo National Forest (BLM Geothermal Lease #CACA-11667) in Sections 29 and 32, Township 3 South, and Range 28 East MD B&M, located northeast of the intersection of U.S. Highway 395 and SR 203, approximately 2 miles east of the Town of Mammoth Lakes in Mono County, California. The CD-IV Project would include construction, operation, and maintenance of up to 16 geothermal resource wells and associated pipelines on portions of BLM Geothermal Leases CACA-11667, CACA-11672, CACA-14407, and CACA-14408 located within the Inyo National Forest in Sections 25, 26, and 36 of T3S, R27E and Sections 30, 31 and 32 of T3S, R28E, MD B&M.

1.2 Agency Roles, Permits, and Decisions

This EIS/EIR has been jointly prepared by three agencies. The lead federal agency is the BLM, Bishop Field Office, with the USFS, Inyo National Forest as a cooperating federal agency. The California State lead agency is the GBUAPCD. The EIS/EIR will inform each agency's decision making process. The roles, permits, and decisions of each agency are:

1. **BLM:** The BLM is the managing agency for subsurface mineral estate including geothermal resources. In order for the Applicant to proceed with construction and operation of the CD-IV Project, the BLM must approve its Application for Geothermal Drilling, Commercial use, Site License and Construction Permit which was submitted was submitted February 17, 2010 and revised June 5, 2012. The BLM may issue a Record of Decision (ROD) to approve, approve with conditions, or deny the application filed by the Applicant.

2. **USFS:** The USFS manages the surface lands in the proposed project area. The CD-IV Project requires the use of National Forest System Roads (NFSR) under the jurisdiction of USFS, unauthorized roads that have been created by users, and new roads for access to the individual wells. The USFS has the discretion to issue authorization (via a special use permit) for the commercial use of these roads. Authorizations required may include specifying access routes, permitting administrative access authorizations, and road construction and maintenance requirements. The USFS Inyo National Forest will use this analysis and EIS to decide whether to approve a Special Use Authorization permit to allow for use of existing roads, construction of new access roads, maintenance of all access roads (including winter plowing), and construction of a transmission line. The USFS will issue its own ROD, separate from the BLM ROD.

3. **GBUAPCD:** The GBUAPCD is the lead agency for compliance with CEQA. The GBUAPCD is responsible for reviewing applications and issuing air permits within the basin. The GBUAPCD's decision will be whether to approve, approve with conditions, or deny an air permit for the CD-IV Project.

Other federal, state, and local agencies also could exercise authority over specific elements of the Proposed Action with respect to land use, biological and cultural resources, stormwater drainage and hydrology issues, roadway easements, and crossing encroachments as described in Section 1.7, *Agency Required Permits*.

1.3 NEPA Purpose and Need and CEQA Project Objectives

1.3.1 NEPA Purpose and Need

In accordance with the Federal Land Policy and Management Act (FLPMA) (Section 103(c)), public lands are to be managed for multiple use, including a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources. Taking into account the multiple use mandate, the purpose for and need for the federal action is to respond to an application submitted by ORNI 50, LLC requesting authorization to construct, operate and decommission the Casa Diablo IV Project (Proposed Action) including commercial geothermal power generation facilities, wells, pipelines, and associated infrastructure for BLM Geothermal Leases CACA-11667, CACA-14407, CACA-14408 and CACA-11672.

The Proposed Action would, if approved, assist in addressing the following management objectives:

- Executive Order 13212, dated May 18, 2001, which mandates that agencies act expediently and in a manner consistent with applicable laws to increase the “production and transmission of energy in a safe and environmentally sound manner.”
- The Energy Policy Act 2005 (EPAct 05), which sets forth the “sense of Congress” that the Secretary of the Interior should seek to have approved non-hydropower renewable energy projects on the public lands with a generation capacity of at least 10,000 MW by 2015.
- Secretarial Order 3285A1, dated March 11, 2009, and amended on February 22, 2010, which “establishes the development of renewable energy as a priority for the Department of the Interior.”

The BLM will decide whether to approve, approve with modifications, or deny the application filed by ORNI 50, LLC. Federal response to the application will include consideration of how the CD-IV project would comply with the federal policies listed above, along with the Geothermal Steam Act of 1970, which provides statutory guidance for geothermal leasing and permitting of leasehold operations by the BLM and Geothermal Resource regulations (43 CFR 3200).

In addition, the USFS will decide whether to approve or deny the issuance of a Special Use Authorization permit to allow for use of existing roads, construction of new access roads, maintenance of all access roads (including winter plowing), and construction of a transmission line on Inyo National Forest managed lands.

1.3.2 CEQA Objectives

Section 15126.6(a) of the CEQA Guidelines requires that a reasonable range of alternatives to a project be described and analyzed. The alternatives must feasibly attain most of the basic objectives of the proposed project. The objectives of the CD-IV Project are to develop the geothermal resources within the BLM-issued geothermal leases at Casa Diablo to produce commercially viable electricity from clean and renewable resources. As described below, this would support California's goals for reducing greenhouse gas (GHG) emissions and dependency on fossil fuels.

California's Renewables Portfolio Standard (RPS) program requires investor-owned utilities, electric service providers, and community choice aggregators to increase their procurement of eligible renewable-energy resources to 33 percent of total procurement by 2020. The California RPS was established in 2002 under Senate Bill 1078, accelerated in 2006 under Senate Bill 107, and expanded in 2011 under Senate Bill 2X (CPUC, 2012).

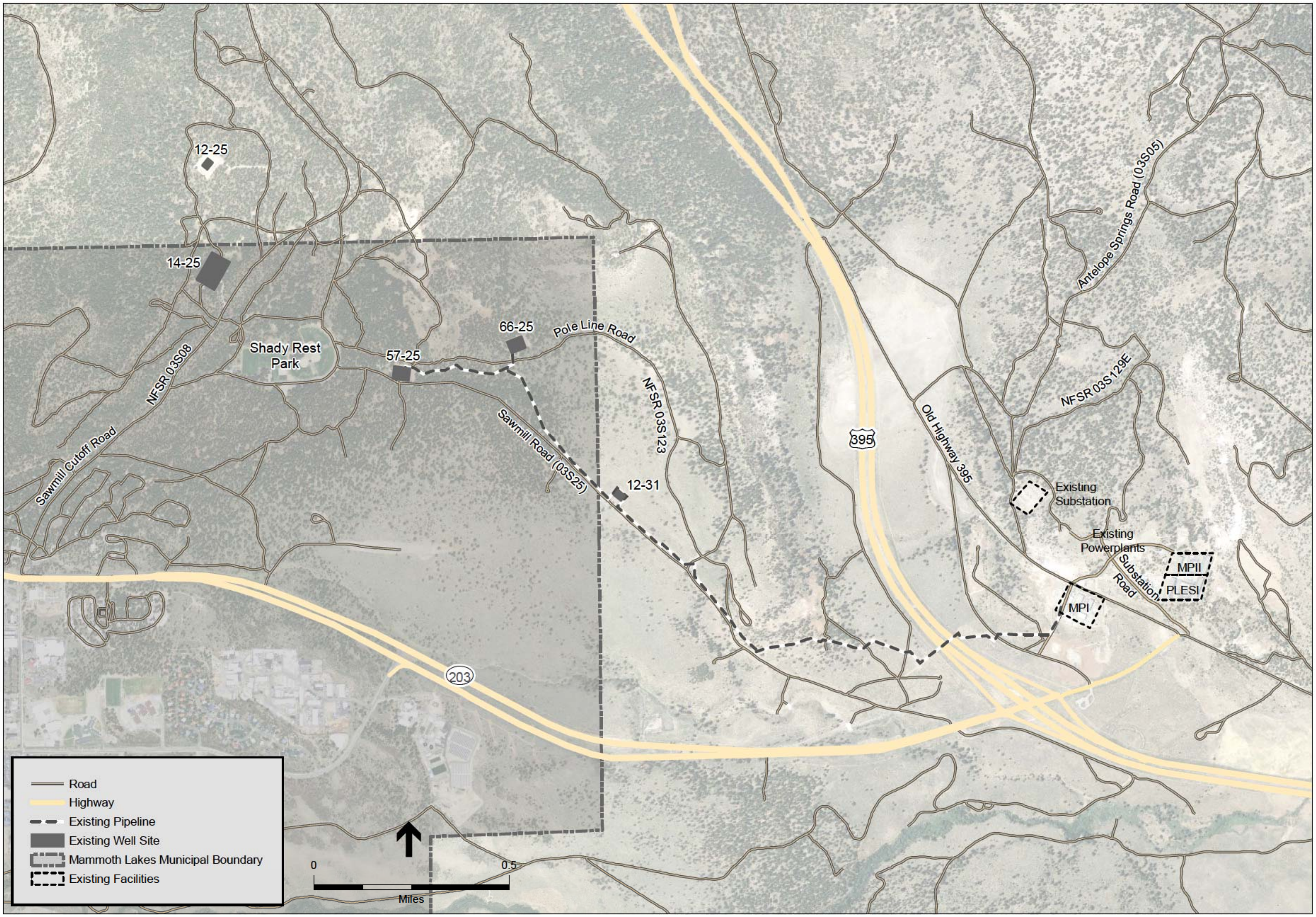
Additionally, in 2006, California adopted the Global Warming Solutions Act of 2006 (Assembly Bill 32),which set the goal of reducing statewide GHG emissions to 1990 levels by 2020 into law. It directed the California Air Resources Board (CARB) to begin developing discrete early actions to reduce greenhouse gases while also preparing a scoping plan to identify how best to reach the 2020 limit. The Climate Change Scoping Plan was originally approved by CARB in 2008, and re-approved on August 24, 2011. One of the key GHG reduction measures in this scoping plan was to increase the RPS from 20 percent by 2010 to 33 percent by 2020.The scoping document says that "increased use of renewables will decrease California's reliance on fossil fuels, thus reducing emissions of greenhouse gases from the electricity sector" (CARB, 2008).

1.4 Project Area Geothermal Leasing and Development History

The Mammoth Lakes geothermal basin has been developed for geothermal power generation since approximately 1984. There are currently three geothermal power plants located within the MPLP Geothermal Complex (Figure 1-1, Existing Facilities). The CD-IV Project would be the fourth geothermal power plant in the complex.

1.4.1 Existing Related Geothermal Facilities

The first unit constructed at the MPLP Geothermal Complex, the MP I project (also called G-1), is a 10 MW geothermal electric generating facility and production and injection well field. It is located on a 90-acre parcel of private (fee) land leased to MPLP approximately 1,200 feet northeast of the intersection of U.S. Highway 395 and California State Route 203 in the Casa Diablo area of Mono County, California (see Figure 1-1). MP I commenced operation in 1984 under a Conditional Use Permit issued by Mono County. The County is currently considering an application to replace the existing MP I power plant with a newer facility (M1 Replacement Project). The M1 repowering project is independent of the CD-IV project and the potential environmental effects are being analyzed in a separate EIR.



Note: Facilities associated with exisitng geothermal power plants east of Highway 395 are not shown on this figure.

SOURCE: Ormat, 2011; NAIP, 2010

Casa Diablo IV Geothermal Development Project . **209487**

Figure 1-1
Existing Facilities

Further development of the geothermal resources involved construction of a second project which consists of two 15 MW units (PLES I and MP II, also called G-2 and G-3, respectively) in 1990. The addition of the second power plant brought the total capacity at the MPLP Geothermal Complex to 40 MW. The MP II project is an existing 15 MW geothermal electric generating facility and production and injection well field located on the same 90-acre parcel of private land leased to MPLP. The MP II power plant is located approximately 1,200 feet east-northeast of the MP I power plant. The MP II project commenced operation in 1990 also under a Conditional Use Permit issued by Mono County.

The 15 MW PLES I Project constructed the third geothermal power plant located immediately south of the MP II project power plant (Figure 1-1). The PLES I power plant is a "twin" to the MP II project power plant and also commenced operation in 1990. The PLES I power plant and associated geothermal production and injection wells are located entirely on a portion of MPLP's BLM Geothermal Lease CACA-11667, which is on National Forest System lands located within and managed by Inyo National Forest.

1.4.2 Project Area Leasing History

In 1973, the DOI produced a Final EIS which analyzed the potential impacts of geothermal leasing, including exploration and development drilling and power plant development, under the Geothermal Steam Act. This EIS specifically analyzed leasing, exploration, and development of areas within Mono-Long Valley Known Geothermal Resource Area (KGRA) (DOI, 1973). In 1979, the USFS completed the "Mammoth-Mono Planning Unit Land Management Plan" and associated EIS. The USFS decision provided for leasing, exploration, and possible development and utilization of geothermal resources within the Mono-Long Valley KGRA, including the Project area.

In 1980, the USFS completed an Environmental Assessment (EA) and issued a Decision Notice which approved geothermal leasing within portions of the KGRA. In 1981, the USFS completed a Supplement to the EA and issued a revised Decision Notice for this same area (USFS, 1981). The 1981 Decision Notice documented that the leases would be issued to include exploration and development of the geothermal resources. It also clarified the environmental issues of concern and revised the special lease stipulations to be attached to the leases from this area, which became known as "Lease Block 1." Within the Project area, Geothermal Leases CACA-11667 and CACA-11672, issued in early 1982 following a competitive bid process, were part of Lease Block 1. The special stipulations attached to these two leases do not contain any site-specific conditions. However, they do reference "environmental concern maps" from the EA which the special stipulations state "should be reviewed by the lessee as guides when developing plans of operation." The issues of concern identified in the EA for those portions of Geothermal Leases CACA-11667 and CACA-11672 within the Project area include protection of the following resources:

1. Visual resources along U.S. Highway 395, State Route 203, and Sawmill Cutoff Road;
2. Recreation resources around the current location of Shady Rest Park;
3. Timber resources at the northern end of Geothermal Lease CA-11672;
4. Watershed resources along Rhyolite Ridge; and
5. Social and economic resources for the entire area west of U.S. Highway 395.

In 1982, the USFS completed a new EA for the area generally north and west of Lease Block 1, which became known as “Lease Block 2” (BLM, 1982). This EA focused on the potential impacts from geothermal resource exploration which would follow leasing. A competitive lease sale was held for this area in 1983. However, in 1984, before the leases were issued, the USFS and BLM prepared a Supplemental EA to specifically assess the effects of geothermal resource development and production, including power plant construction and operation, especially on water quality and quantity, recreation, and visual resources (USFS and BLM, 1984). Within the Project area, Geothermal Leases CACA-14407 and CACA-14408 were issued as part of Lease Block 2 in early 1985. These leases contain a special stipulation which states that “Except as otherwise approved by the BLM and the Forest Service, no surface disturbing activities related to geothermal energy development will be permitted on the land designated as No Surface Occupancy areas. In order for exploration or development activities to be approved on these lands, the lessee must show that the proposed activity or development can take place without significantly affecting USFS management objectives for the land in question. Such objectives include visual quality objectives, recreation objectives, and wildlife habitat and population objectives” (BLM, 1984). The CD-IV Project components affected by these stipulations include pipelines and wells in the vicinity of wells 12A-31, 23-31, 35-31, 81-36, 14-25 and 15-25, as shown on Figure 1-2 (Restricted Surface Occupancy Area). More detailed discussion is included in Section 4.18 Visual Resources.

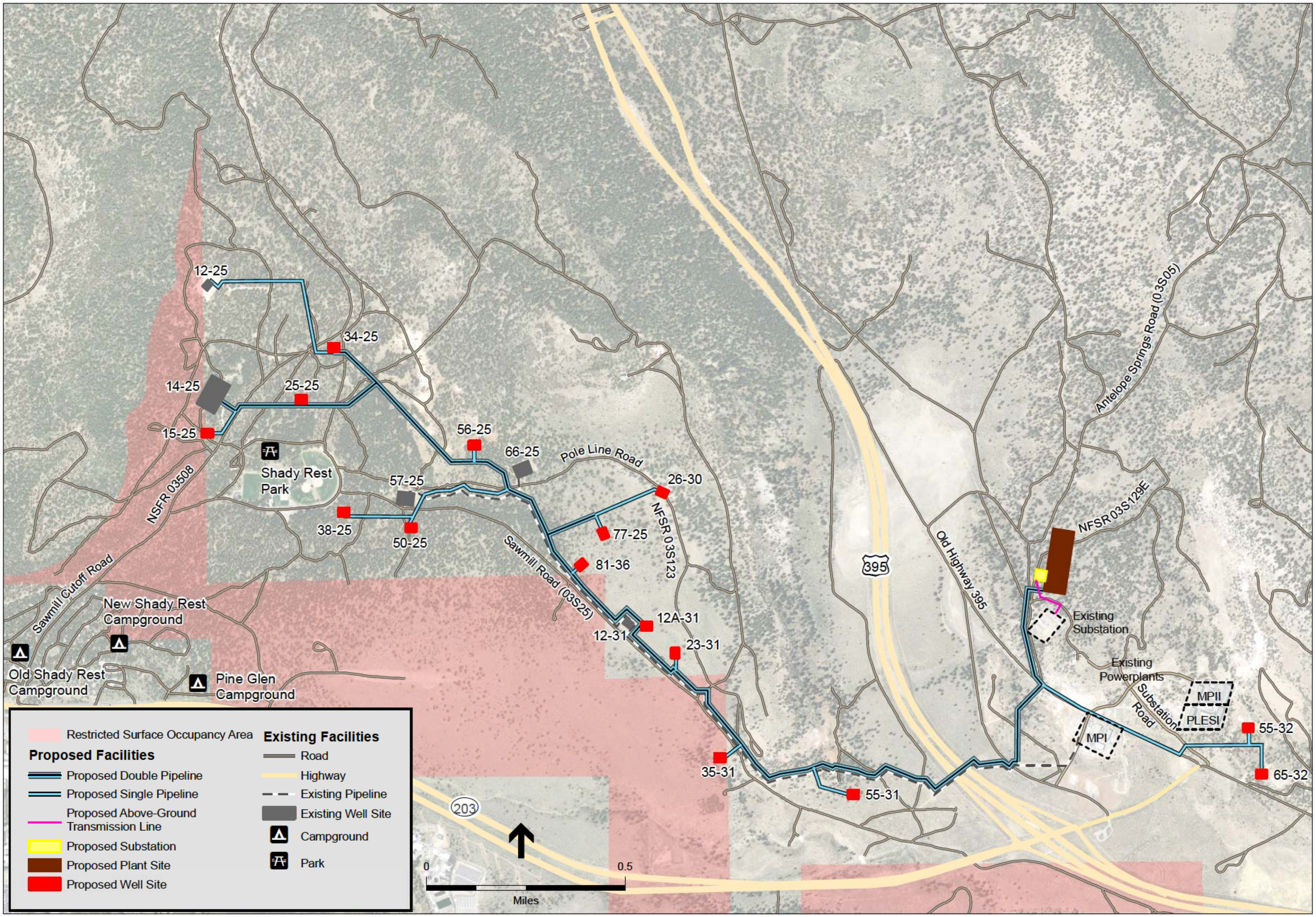
These environmental documents previously prepared for the geothermal leasing decisions are incorporated by reference into this Draft EIS/EIR and listed in the list of references (Chapter 7). Summaries of the relevant information from these documents are provided in this Draft EIS/EIR where applicable.

1.4.3 CD-IV Project Wells Exploration History

Fifteen of the geothermal production and injection well sites proposed as part of the CD-IV Project have been approved for exploration drilling under previous NEPA and CEQA documents. In some cases, exploration and monitoring drilling has occurred at proposed well sites. Chapter 2 provides detailed well history information as part of the Alternative 1 description.

1.5 Relationship to Statutes, Regulations, and Other Plans

Further development of geothermal resources in the project area would be consistent with federal laws and regulations, other plans, programs, and policies of other federal, state, and local government agencies, to the extent practical. Specific approvals, permits, and regulatory requirements would be required for constructing, operating, and maintaining the CD-IV Project components.



SOURCE: USFS, 2011; Ormat, 2011; NAIP, 2010

Casa Diablo IV Geothermal Development Project . 209487

Figure 1-2
Restricted Surface Occupancy Area

1.5.1 Federal Policy Consistency and Land Use Plan Conformance

1.5.1.1 Geothermal Steam Act and Implementing Regulations

The CD-IV Project would be conducted in large part on lands which were leased by the United States of America to MPLP under the Geothermal Steam Act of 1970 ("Act"). Geothermal leases convey the "exclusive right and privilege to drill for, extract, produce, remove, utilize, sell, and dispose of geothermal steam and associated geothermal resources" on these leased lands. To maintain this right, the lessee must "diligently explore the leased lands for geothermal resources until there is production in commercial quantities" applicable to each of these leases. The lessee must pay annual rentals to the federal government, and must expend increasing dollars until the production of geothermal resources in commercial quantities is achieved.

The Act gives the Secretary of the Interior the responsibility and authority to manage geothermal operations on lands leased for geothermal resource development by the United States of America. The Secretary has delegated this authority to the BLM. All operations conducted on the geothermal lease by the geothermal lessee are subject to the approval of the BLM. Under the regulations adopted to implement the Act (43 CFR 3200 et seq.), the BLM must review a Plan of Operation for drilling or a Utilization Plan for resource utilization operations ("Plan") submitted by a geothermal lessee.

1.5.2 National Energy Policy

The Proposed Action is in accordance with the EPAct of 2005 (Public Law 109-58), specifically The John Rishel Geothermal Steam Act Amendments of 2005, which sought to increase renewable energy production, including geothermal resources. It is also consistent with Executive Order 13212 (May 2001) as amended by Executive Order 13302 (May 15, 2003), which directed executive departments and agencies to take appropriate actions, to the extent consistent with applicable law, to expedite projects that would increase the production, transmission, or conservation of energy. It also directed agencies to expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining safety, public health, and environmental protections. Consistent with §2 of the Mining and Mineral Policy Act (MMPA) of 1970 and §§102(a)(7), (8), and (12) of the FLPMA, it is the policy of the DOI to encourage the development of mineral resources, including geothermal resources, on federal lands. Finally, the Proposed Action is consistent with the Geothermal Energy Research, Development, Demonstration Act of 1974, which promotes the development and utilization of geothermal resources.

1.5.2.1 BLM Bishop Field Office Resource Management Plan

The Bishop Resource Management Plan (RMP)(1993) provides planning direction for the 750,000 acres of public land surface and 9,000 acres of federal mineral estate in the Bishop Field Office Area. Key issues addressed in this RMP include recreation, wildlife habitat, minerals, and land tenure adjustment. The Proposed Action is supported by an Area-Wide decision that states "Provide for geothermal exploration and development" (BLM, 1993). Decisions for specific

Management Areas prohibit geothermal exploration and development where it would conflict with other high-priority resource concerns. For the Long Valley Management Area (RMP page 43), the RMP states that geothermal and other developments must be consistent with safety mitigation in the Mammoth-June Lake airport plan restricting height, lighting and steam emissions. There are no RMP decisions that would exclude the Proposed Action from going forward into environmental analysis. Therefore, the Proposed Action would be consistent with management decisions within the RMP area.

1.5.2.2 Inyo National Forest Land and Resource Management Plan

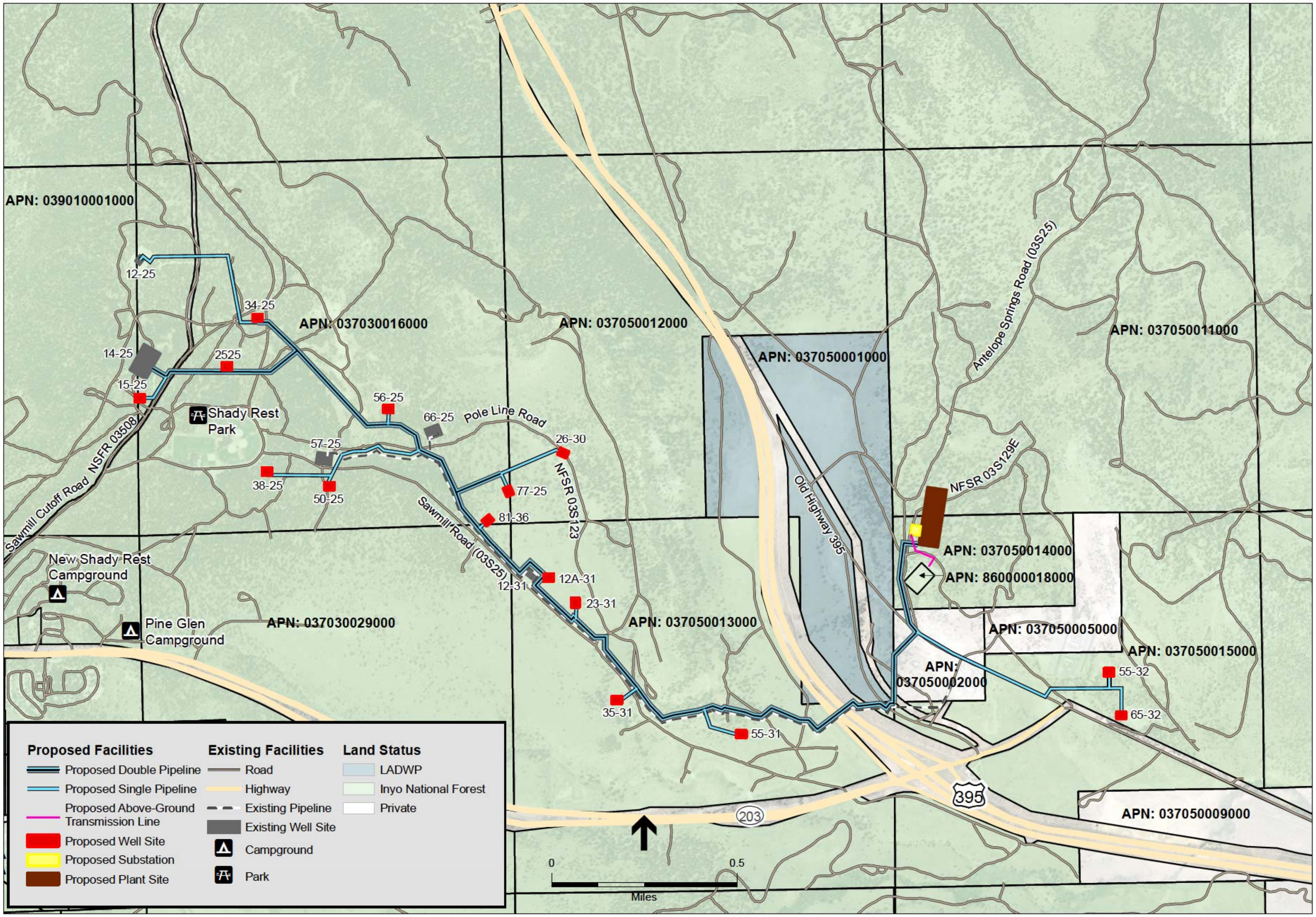
The Proposed Action would be located on National Forest System lands administered by the USFS as part of the Inyo National Forest as shown on Figure 1-3 (Land Status in the Project Vicinity). Land uses within the Inyo National Forest are governed by the 1988 Inyo National Forest Land and Resource Management Plan (LRMP). The LRMP (USFS, 1988) provides integrated multiple resource management direction for all Forest resources for the plan period. The Forest-wide Standards and Guidelines set the minimum resource conditions that would be maintained throughout the forest. The Management Area Direction provides general direction for the management of areas whose boundaries are defined with reference to its unique characteristics.

The LRMP includes the following Standards and Guidelines for General Mineral Management.

1. Administer mining laws and regulations to permit the uninterrupted production of minerals while assuring the adequate protection of other resources and environmental values.
2. Where valid existing rights within withdrawn areas are exercised, operating plans should be consistent with the purpose of withdrawals.
3. Coordinate the mineral management program with the BLM.

The LRMP also includes the following Standards and Guidelines for the management of Leasable Minerals, which includes Geothermal Resources.

1. Provide for the leasing of National Forest lands for exploration and development of oil, gas and geothermal resources commensurate with other resource values. Follow existing Memoranda of Understanding between the BLM and the USFS that relate to oil, gas, and geothermal mineral activities. Follow applicable regulations, operating orders, and notices for oil, gas and geothermal leases issued pursuant to appropriate authority.
2. Prepare environmental documents that analyze full-scale development prior to consenting to BLM’s issuance of geothermal leases.
3. Prepare post-lease environmental documents in cooperation with the BLM for site-specific exploration, development, and production proposals. Assure that impacts to resources are appropriately analyzed. Assure that impacts to these resources are mitigated to the extent possible.
4. Consider the location of fluid conveyance lines and facilities for geothermal development to ensure the viability of deer migration corridors. Encourage geothermal development that utilizes air cooling rather than evaporative cooling systems.



Note: Existing well faciltlies east of Highway 395 are not shown on this figure.

SOURCE: USFS, 2011; Ormat, 2011; Mono County, 2012

Casa Diablo IV Geothermal Development Project . **209487**

Figure 1-3
Land Status in the Project Vicinity

Standards and Guidelines apply to other resource areas as well and are incorporated here by reference.

The project area is within two LRMP management areas: “Mammoth” (#9) and “Upper Owens River” (#7). The LRMP notes that uses in Management Area #9 are directly related to the support of nearby Mammoth Lakes. These include various utilities, the Mammoth Lakes/Yosemite Airport, various parks, the Hot Creek Fish Hatchery, and land owned by the City of Los Angeles. Management Area #9 also contains two important viewsheds (along U.S. Highway 395 and State Route 203), portions of two grazing allotments (one cattle and one sheep), and is important as a mule deer migration path and staging area in the fall and spring. During the spring migration, mule deer leave their winter ranges and congregate in intermediate “staging areas” for several weeks before moving into their summer ranges. Deer forage and regain physical conditioning in these staging areas that is lost over the winter.

The LRMP identifies four “Management Prescriptions” applicable to the project area. In Management Area #7, Management Prescription 9 (Uneven Aged Timber Management) applies to the northeast corner of the Project area. Management Prescription 16 (Dispersed Recreation) applies to a very small portion of the northwest corner of the Project area. In Management Area #9, Management Prescription 12 (Concentrated Recreation Area) and Management Prescription 15 (Developed Recreation Site) each apply.

In January 2004, the ROD for the Sierra Nevada Forest Plan Amendment (SNFPA) Supplemental Final Environmental Impact Statement was signed (USFS, 2004). This ROD replaced in its entirety the ROD signed in January 2001 for the Sierra Nevada Forest Plan Amendment Final Environment Impact Statement. The ROD amended the Pacific Southwest Regional Guide and the LRMPs for national forests in the Sierra Nevada, including the Inyo National Forest. The SNFPA focused on and established new Forest LRMP Standards and Guidelines for five specific problem areas: the protection of old forest ecosystems and associated species; the protection of aquatic, riparian and meadow ecosystems and associated species; the management of fire and fuel loading; reducing the potential for noxious weeds; and the enhancement of hardwood forest ecosystems in the lower west side of the Sierra Nevada.

Only the provisions addressing the protection and viability of native plant and animal species associated with old forest ecosystems; the protection of aquatic, riparian, and meadow ecosystems; and, the reduction of the potential for noxious weeds are applicable to the project area. The Proposed Action, with the implementation of adequate mitigation is consistent, to the extent applicable, with the general intent and specific goals of the January 2004 SNFPA ROD.

1.5.3 State and Local Applicable Plans and Programs

1.5.3.1 Mono County General Plan

The Mono County General Plan establishes land use designations to guide development in the unincorporated portions of the County. Two General Plan land use designations apply to the CD-IV Project: Resource Management/Inyo National Forest (RM) and Resource Extraction (RE). Land within the National Forest System is managed by the USFS and designated Resource Management. Parcels that are privately owned are designated both Resource Management and Resource Extraction include APNs 037-050-002 and -005. Resource Management designated lands are located on the western end of the MPLP owned private land and the Resource Extraction designated lands are at the eastern end (County of Mono Planning Department, 2009, 2010).

The Resource Management designation is intended "to recognize and maintain a wide variety of values in the lands outside existing communities," including geothermal or mineral resources. Mining and geothermal exploration projects are subject to use permit within the Resource Management designation, and other similar uses may also be permitted. The MPLP MP I project power plant and well field are located on the MPLP-leased private land parcel zoned Resource Management. Lands designated Resource Management/Inyo National Forest are subject to the land use authority of the LRMP.

The Resource Extraction designation "is intended to provide for protection of the environment and resource extraction activities." Exploring, drilling, and development of geothermal resources are subject to use permit within the Resource Extraction designation, and other similar uses may also be permitted (County of Mono Planning Department, 2010).

1.5.3.2 Town of Mammoth Lakes General Plan

The Town of Mammoth Lakes (Mammoth Lakes) General Plan describes three planning boundaries: the urban growth boundary, where development consistent with its land use policies is allowed; the municipal boundary, which includes some private land and some land administered by the USFS as part of the Inyo National Forest; and an approximately 80,000-acre "planning area," which includes additional areas of Inyo National Forest and some private land in unincorporated Mono County where Mammoth Lakes considers existing or proposed development to have an impact on the Mammoth Lakes community (Mammoth Lakes, 2007).

The southwestern portion of the project area would be located within the municipal boundary of Mammoth Lakes. Within the project area, the land inside the municipal boundary is designated "open space." This land is part of the Inyo National Forest; therefore, land use planning and management in this area is under the jurisdiction of the USFS. However, the Proposed Action is consistent with the Mammoth Lakes open space designation, which specifically permits geothermal exploration and production (Mammoth Lakes, 2007). The remainder of the Project area is located within the Mammoth Lakes planning area, as described above.

1.6 Agency Required Permits

1.6.1 Federal Agencies

The BLM is the federal agency delegated with the responsibility for managing all geothermal operations on federal lands leased for geothermal resource development. All operations conducted on the geothermal leases by MPLP are subject to the approval of the BLM. Approval of ORNI 50, LLC's Application (ORNI 50, LLC, 2012) would authorize ORNI 50, LLC to build and operate the CD-IV Project. However, ORNI 50, LLC could not commence construction until BLM issues approval of the Plan of Utilization, a Site License and a Facility Construction Permit, Geothermal Drilling Permits, a Commercial Use Permit, and Geothermal Sundry Notices (to conduct subsequent well operations on the geothermal wells or make any changes in any other previously approved permit). The BLM would consult with the California State Historic Preservation Officer (SHPO), as required under section 106 of the National Historic Preservation Act (NHPA).

The USFS is the federal agency responsible for managing and administering surface activities within national forests. Because the federal geothermal leases are located within the Inyo National Forest, the BLM must consult with the USFS as it prepares the Draft EIS/EIR. The BLM authorizations would include Conditions of Approval for surface use and occupancy based on recommendations from the USFS to ensure consistency with the LRMP. Additionally, the USFS would issue a Special Use Permit for the transmission line and road use, maintenance and construction. The USFS would also consult with the U.S. Fish and Wildlife Service (USFWS) if the USFS determines that the Proposed Action may affect listed species or designated critical habitat, as required under section 7 of the Endangered Species Act, and the California State Historic Preservation Officer (SHPO), as required under section 106 of the National Historic Preservation Act (NHPA).

1.6.2 Local and State Agencies

Mono County is the local agency responsible for land use planning and authorizations on the private lands which may be disturbed within the project area. Activities proposed on the private lands within the Project area by ORNI 50, LLC are subject to the approval of a use permit by Mono County through the Mono County Energy Management Department and the Mono County Planning Commission. If required, ministerial building permits for construction of some aspects of the CD-IV Project would be granted by the Building Division of the Mono County Community Development Division.

The California State Water Resources Control Board (SWRCB) is the state agency responsible for protecting the quality of surface and ground waters in the state. ORNI 50, LLC would be required to submit to the SWRCB a Notice of Intent (NOI) to comply with the terms of the general permit to discharge storm water associated with construction activity.

The California Department of Transportation (Caltrans) is responsible for maintaining U.S. Highway 395. Activities conducted within (or under) the U.S. Highway 395 right-of-way requires Caltrans' approval. Caltrans approval of an encroachment permit would be required in order for ORNI 50, LLC to construct the geothermal fluid pipeline under U.S. Highway 395.

The California Department of Fish and Game (CDFG) is the state agency principally responsible for the protection and conservation of the fish and wildlife resources of the state. No CDFG permits are expected to be required for this project.

The GBUAPCD is the state/local agency responsible for regulating stationary (non-vehicular) sources of air pollution in Mono, Inyo and Alpine counties. ORNI 50, LLC would be required to obtain an Authority to Construct and a Permit to Operate from the GBUAPCD.

1.7 Joint NEPA/CEQA Document

1.7.1 Conformance with NEPA and CEQA

This Draft EIS/EIR was prepared as a joint federal/state environmental document, as encouraged by NEPA regulations [40 CFR 1506.2(c)] and CEQA regulations (CEQA Guidelines §15226). A third party consultant, Environmental Science Associates (ESA), prepared the NEPA/CEQA document under the direction of the BLM, USFS, and the GBUAPCD. A Letter of Understanding (LOU) among the BLM, USFS, and MPLP, and a Memorandum of Understanding (MOU) among the BLM, GBUAPCD, and MPLP, were signed by these parties. Collectively, the LOU (BLM et al., 2010a) and the MOU (BLM et al., 2010b) established the requirements, responsibilities, and procedures for preparing a joint environmental document to meet the NEPA/CEQA requirements for evaluating the proposed CD-IV Project.

The Draft EIS/EIR was prepared to conform to the policy guidance provided in BLM's NEPA Handbook (BLM Handbook H-1790-1). This handbook provides instructions for compliance with the Council on Environmental Quality's (CEQ's) regulations (40 CFR 1500-1508) for implementing NEPA and the DOI manual guidance on NEPA (516 DM 1-7). This Draft EIS/EIR was also prepared to conform to the policy guidance provided in USFS's Environmental Policy and Procedures Handbook (Forest Service Manual [FSM] 1909.15). This handbook also provides instructions for compliance with CEQ regulations for implementing NEPA, the USDA's NEPA Policies and Procedures (7 CFR 1b), and the FSM (1950).

CEQA Guidelines sections 15220 to 15228 provide some guidance for preparing joint NEPA/CEQA documents, whereas NEPA regulations do not. Therefore, this Draft EIS/EIR follows CEQA guidance for joint NEPA/CEQA documents.

1.7.2 Public Scoping

The lead agencies solicited internal and external input on the issues, impacts, and potential alternatives to be addressed in the Draft EIS/EIR for the CD-IV Project, as well as the extent to which those issues and impacts would be analyzed in the document. This process is called "scoping" under both NEPA and CEQA (40 CFR §1501.7; 14 CCR §15000 et seq.). Internal input was provided by the lead agencies and cooperating agency staff as an interdisciplinary process, to help define issues, alternatives, and data needs. External scoping involved notification and opportunities for feedback from other agencies, organizations, tribes, local governments, and the public. Formal public scoping begins following publication of a Notice of Intent (NOI) to prepare an EIS under NEPA and release of a Notice of Preparation (NOP) of an EIR under CEQA for a proposed project.

The NOI for the CD-IV Project was published in the Federal Register on March 25, 2011 (76 FR 1686). The GBUAPCD submitted the NOP to the State Clearinghouse, responsible and trustee agencies, and local jurisdictions on April 1, 2011, announcing the anticipated preparation of the Draft EIS/EIR for the project. The NOI and NOP were also posted on the BLM/USFS and GBUAPCD websites, respectively, and notice of scoping meetings was sent to local agencies and community organizations, Indian tribes, and radio, television, print, and internet news sources. Notice of the scoping meetings was published in the Town of Mammoth Lakes Town e-News on April 15, 2011. Two scoping meetings were conducted on April 18 and 19, 2011 and written comments were accepted through May 9, 2011.

Following the scoping period, a scoping report was prepared in July 2011, collecting and summarizing the issues, impacts, and potential alternatives suggested in scoping comments for analysis in the Draft EIS/EIR. This scoping report is included as **Appendix A**. NEPA and CEQA scoping for the CD-IV Project identified several issues to be considered during analysis. These include:

1. **Air quality, climate change, and greenhouse gas emissions:** Commenters requested that the EIS/EIR discuss and quantify the CD-IV Project's potential air pollutant and greenhouse gas emissions and their impacts, including cumulative impacts for each alternative, and compliance with regulatory requirements, including new source review and Title V permits under the Clean Air Act if applicable. The EIS/EIR should identify emissions control and mitigation plans and specific actions to reduce emissions. Potential effects of climate change on the Project and on exacerbating Project impacts on the environment should be described. The analysis should compare the Project's emissions to comparably sized renewable energy projects using other technologies, and consider design alternatives that would minimize Project and cumulative emissions. Odor impact should be described and mitigated.

2. **Aesthetics:** Commenters expressed concern about potential aesthetic impacts from nearby public and private viewpoints and requested that the EIS/EIR discuss alternatives and/or mitigation measures to reduce these impacts.

3. **Archaeological and cultural resources:** The EIS/EIR should include detail about government-to-government consultation and regulatory compliance for the CD-IV Project and address the possibility of Indian sacred sites being located in the project area. Avoidance and mitigation measures should be used to avoid adverse effects on archaeological and cultural resources, including the potential for interference with current culturally important uses.

4. **Biological resources:** Commenters requested that the EIS/EIR assess the existing resources in the project vicinity and analyze the CD-IV Project's potential direct, indirect, and cumulative effects on both vegetation and wildlife, including the potential for loss of habitat and wildlife movement corridors, and impacts to special-status species. Avoidance and minimization of impacts should be prioritized over mitigation, and on-site restoration or enhancement should be prioritized over off-site mitigation. The EIS/EIR should analyze the potential for introduction or spread of invasive plants and the resulting effects on wildlife habitats.

5. **Hydrology and water resources:** The EIS/EIR should analyze and, if necessary, provide avoidance or mitigation measures for CD-IV Project impacts on surface and groundwater supply, flows, temperatures, and quality. The analysis should independently review information provided by the Applicant's technical specialists.

6. **Land use plans and policies:** Commenters requested that the EIS/EIR evaluate the CD-IV Project's conformance with current and reasonably foreseeable land use plans.

7. **Public safety and health:** Commenters expressed concern related to potential hazards associated with the CD-IV Project facilities, and requested that the EIS/EIR analyze the potential impacts of worst-case hazardous conditions on nearby residential areas and other uses.

8. **Recreational resources:** Commenters requested that the EIS/EIR address recreation-related hazards associated with piping and transmission lines and aesthetic, noise, and other impacts in and near recreation areas.

9. **Socioeconomics and environmental justice:** Commenters expressed concern about the Project's effects on local economies and on nearby populations of concern for disproportionately adverse environmental effects.

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CHAPTER 2
Proposed Action and Alternatives

2.1 Introduction

This chapter of the EIS/EIR fully describes: (1) the ORNI 50, LLC proposed Casa Diablo IV Geothermal Development Project (CD-IV Project or Proposed Action); (2) an alternate power plant location alternative; and (3) a modified pipeline alignment alternative. This chapter also describes a No Action Alternative, the alternatives development process, and alternatives considered but eliminated from detailed analysis.

Alternatives considered in the EIS/EIR are based on issues identified by the BLM, USFS, and GBUAPCD, as well as comments received during the public scoping process. The lead agencies are required to consider in detail a range of alternatives that are considered “reasonable,” usually defined as alternatives that are realistic (not speculative), technologically and economically feasible, and that respond to NEPA purpose and need and CEQA objectives for the project.

Technical information about the Proposed Action in this chapter was provided by the ORNI 50, LLC for the geothermal energy facility. All numbers referring to land disturbance, equipment, schedule, mileage, and workforce are based on the most up-to-date engineering data available from ORNI 50, LLC. The numbers are based on best available information and generally represent conservative estimates for purposes of analyzing impacts. The numbers may change based on final engineering and permit requirements for the project components. ORNI 50, LLC’s information was provided primarily in the Draft Plan of Development (POD), Plan of Operation and Plan of Utilization (POU) for the CD-IV Project submitted to the BLM in February 2010 (MPLP, 2010), and then updated in June 2012 (ORNI 50 LLC, 2012). More detailed information has been provided through the development of this EIS/EIR.

2.1.1 Alternatives Development and Screening

This section outlines the process used by the lead agencies to develop the alternatives. Alternatives considered by ORNI 50, LLC and the BLM along with those suggested by the public during the scoping process were evaluated using the following criteria:

1. Does the alternative fulfill the NEPA purpose and need, and CEQA objectives identified in Chapter 1?
2. Does the alternative minimize effects to human/environmental resources?
3. Is the alternative feasible to construct, operate, maintain, and decommission?

Alternatives that met all of the criteria listed above were carried forward for analysis and are detailed in Sections 2.2 through 2.4. Those that did not meet the criteria were eliminated from further analysis and are described in Section 2.7, along with the reasons for elimination.

2.1.2 Applicant Goals and Objectives

ORNI 50, LLC's goal is to further develop the geothermal resources in the Mono-Long Valley area to produce electricity from clean and renewable resources. Specifically, the objectives for the CD-IV Project are to:

1. Develop and operate a geothermal project utilizing the leased geothermal resource with production/injection wells/pads and related structures.
2. Safely construct and operate a 33-megawatt (MW; net) geothermal power plant,
3. Site the project within Long Valley Caldera Known Geothermal Resource Area (KGRA)
4. Locate the geothermal power plant in an area that has been identified by local government as suitable for geothermal energy development.
5. Assist with federal and state mandates for achieving greenhouse gas (GHG) reductions, as further explained below.
6. Assist California in repositioning its generation asset portfolio to use more renewable energy in conformance with state policies, including the policy objectives set forth in SB 1078 (California Renewable Portfolio Standard [RPS] Program), Assembly Bill (AB) 32 (California Global Warming Solutions Act of 2006), and SB X 1-2 recently signed by Governor Brown in April 2011 to codify the 33 percent RPS by 2020.
7. Generate renewable electricity that will be qualified as meeting the RPS requirements of the California Energy Commission (CEC), California Public Utility Commission (CPUC), and the Western Renewable Energy Generation Information System (WREGIS) program for tradable renewable energy credits.
8. Provide relatively low-GHG, base load renewable generation that could facilitate the replacement of higher-GHG-emitting fossil fuel fired electricity generation, generation that relies on water for once-through cooling, and aging power plants.
9. Help meet the requirements of the National Energy Policy Act of 2005, the Bureau of Land Management's (BLM) implementation strategy titled, BLM Implementation of the National Energy Policy, and other federal policies that encourage the use of alternative and renewable energy.

2.1.3 CEQA Requirements for Alternatives Analysis

The CEQA Guidelines section 15126.6(a) state that an EIR must describe and evaluate a reasonable range of alternatives to the proposed project that would feasibly attain most of the project's basic objectives and would avoid or substantially lessen any significant adverse environmental effects of the project. An EIR need not consider every conceivable alternative to the proposed project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation. The EIR must evaluate the comparative merits of the alternatives and include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. Specifically, the CEQA Guidelines set forth the following criteria for selecting alternatives:

1. The discussion of alternatives should focus on alternatives to the project or its location that are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives or would be more costly (§15126.6(b)).
2. The range of potential alternatives should include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects (§15126.6(c)).
3. The specific alternative of "No Project" (referred to as the No Project Alternative) should also be evaluated along with its impact (§15126.6(e)(1)).
4. The alternatives should be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives should be selected and discussed so as to foster meaningful public participation and informed decision making (§15126.6(f)).

In accordance with CEQA, appropriate alternatives for EIR analysis are those that meet most of the project's basic objectives *and* avoid or substantially lessen the significant environmental impacts of the proposed project.

2.1.4 Overview of the Alternatives Considered in Detail

The three action alternatives and one No Action Alternative, which are described in detail in Sections 2.2 through 2.5, are as follows:

1. Alternative 1 – Proposed Action Alternative: This alternative was developed by ORNI 50, LLC and represents their preferred project design;
2. Alternative 2 – Plant Site Alternative: This alternative was developed to reduce the amount of tree removal required and the potential visual effects from construction on the proposed power plant site;
3. Alternative 3 – Modified Pipeline Alternative: This alternative was developed to reduce potential impacts on visual, cultural and wildlife resources in the Basalt Canyon area; and
4. Alternative 4 – No Action Alternative.

Under Alternative 4, none of the project components would be built. This alternative is equivalent to the No Project Alternative under CEQA.

The action alternatives have a common description of equipment, systems, processes, resource inputs, operations, closure plans, and general location. All of the three Action Alternatives propose development of a 33 MW (net) geothermal power plant, utilizing up to 16 geothermal wells, and associated pipelines and ancillary facilities. The alternatives differ in the location of the power plant and pipelines. As such, in order to avoid redundancy, Section 2.2 presents a description of the Proposed Action that identifies the elements that are common to all alternatives. Sections 2.3 and 2.4 discuss how Alternative 2 and Alternative 3 differ from the Proposed Action. Section 2.5 presents the No Action Alternative. Table 2-1 presents a comparison of the key components of each alternative.

2.2 Alternative 1 – Applicant Proposed Action

ORNI 50, LLC proposes to build, operate, and decommission the CD-IV Project in the vicinity of the existing Casa Diablo geothermal complex near the Town of Mammoth Lakes in Mono County, California (Figures 1-1 and 2-1). The Proposed Action would consist of the following facilities:

1. A geothermal power plant consisting of two (2) Ormat Energy Converter (OEC) binary generating units (21.2 MW gross each) with vaporizers, turbines, generators, air-cooled condensers, preheaters, pumps and piping, and related ancillary equipment. The gross power generation of the CD-IV plant would be 42.4 MW. The estimated auxiliary and parasitic loads (power used within the project for circulation pumps, fans, well pumps, loss in transformers and cables) is about 9.4 MW, thus providing a net power output of about 33 MW. Additional components of the power plant would include:

    a) A motive fluid system consisting of motive fluid (n-pentane) storage vessels (either one or two vessels in the range of 9,000 to 12,000 gallons) and motive fluid vapor recovery systems (VRUs). Each VRU would consist of a diaphragm pump and a vacuum pump.

    b) A new substation would be constructed on the power plant site and would be connected to the SCE Casa Diablo Substation at Substation Road.

    c) An overhead 33 kV transmission line connecting the power plant substation with the SCE Casa Diablo Substation approximately 650 feet (198 meters) long.

2. Up to 16 geothermal wells are proposed. Fourteen of the wells would be located in the Basalt Canyon Area and two wells would be located southeast of the proposed power plant east of U.S. Highway 395. The specific locations for these wells would be selected out of the 18 possible locations shown in Figure 2-2. The actual number may be less depending on the productivity of the wells. The final number and location of wells would be determined by modeling and actual drilling results. Approximately half of the wells would be production wells and the other half would be injection wells. Each production well would range in depth from 1,600 to 2,000 feet below ground surface (bgs), and each new injection well would be drilled to approximately 2,500 feet bgs. Production wells would be equipped with a down-hole pump powered by a surface electric motor. Most of the well sites in Basalt Canyon have been analyzed previously for the development of exploratory wells, two of which were drilled in 2011. Additional detail is provided in Section 2.2.4.

3. Piping would extend from production wells to the power plant and from the power plant to the individual injection wells. Two main pipelines would parallel the existing Basalt Canyon pipeline and would cross beneath U.S. Highway 395 between the wellfield and the CD-IV power plant site.

    a) Power and control cables for the wells would be installed in above-ground cable trays placed on the pipeline supports. Appurtenant facilities include pumps, tanks, valves, controls, and flow monitoring equipment.

TABLE 2-1
COMPARISON OF PROPOSED ACTION AND ALTERNATIVES

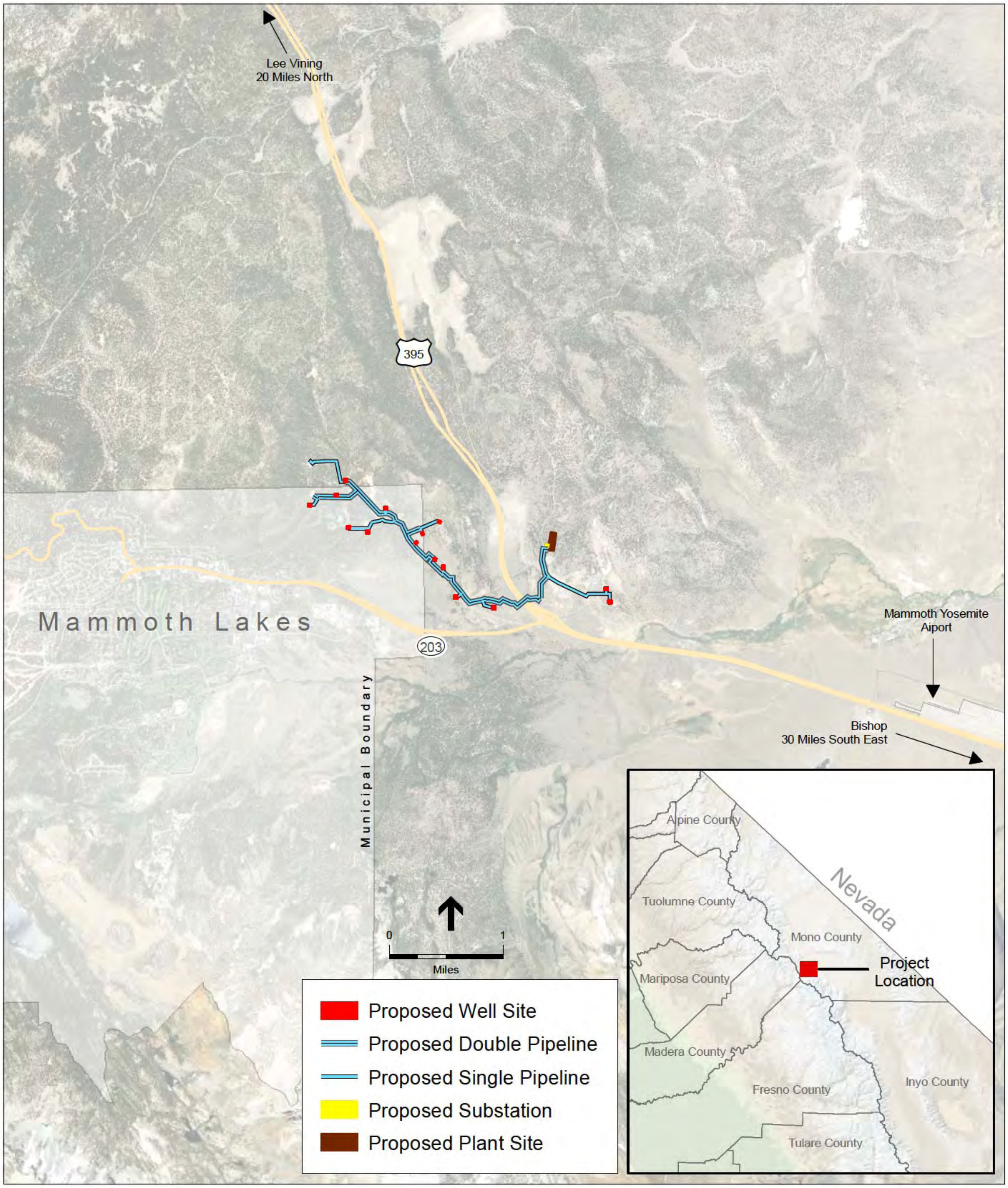
Alternative 1 – Proposed Action	Alternative 2 –Plant Site Alternative	Alternative 3 – Modified Pipeline Alternative	Alternative 4 – No Action
Power Plant Site Location			
North of SCE substation	East of existing plants and proposed Well 65-32	Same as Proposed Action	None
Power Plant Components			
Phased construction of power plant (2 years)	Same as Proposed Action	Same as Proposed Action	None
2 OEC binary generating units	Same as Proposed Action	Same as Proposed Action	None
New substation (north of SCE)	New substation adjacent to plant (east of Well 65-32)	Same as Proposed Action	None
Approximately 650 feet of electrical transmission line to the existing SCE Casa Diablo Substation	Approximately 5,000 feet of electrical transmission line to the existing SCE Casa Diablo Substation	Same as Proposed Action	None
Geothermal Pipelines			
Pipeline corridor (if all wells are drilled): Total corridor length: 5.68 miles Length of double pipelines: Approximately 60% (up to 3.5 miles) Total pipeline length: 9.2 miles (14.8 km)	Pipeline corridor (if all wells are drilled): Total corridor length: 5.54 miles Length of double pipelines: Approximately 70% (up to 3.9 miles) Total pipeline length: 9.3 miles (15.0 km)	Pipeline corridor (if all wells are drilled): Total corridor length: 5.42 miles Length of double pipelines: Approximately 67% (up to 3.7 miles) Total pipeline length: 9.1 miles (14.6 km)	None
Production pipeline from all Basalt Canyon wells, crossing under U.S. Highway 395 and north to power plant	Production pipeline same as Proposed Action west of U.S. Highway 395. To access alternative plant site, production pipeline crosses under U.S. Highway 395 and east to power plant	East of U.S. Highway 395, the production pipeline would be the same as the Proposed Action; west of U.S. Highway 395, modified pipeline route to Wells 77-25, 26-30, 56-25, 25-25, 34-25, 15-25, 14-25 and 12-25.	Existing pipeline would remain in place; no new pipelines would be constructed.
Spent brine injection pipelines: (1) Approximately 6,000 feet from power plant south and east to Wells 55-32 and 65-32 (2) Injection pipeline to Basalt Canyon (injection well locations to be determined) would be constructed parallel to existing pipeline and proposed production pipeline west of U.S. Highway 395.	Spent brine injection pipelines: (1) Approximately 1,900 feet from alternative power plant site west to Wells 55-32 and 65-32 (2) Injection pipeline to Basalt Canyon would be constructed west from the alternative power plant site to U.S. Highway 395. Pipeline alignment would be the same as the Proposed Action west of U.S. Highway 395.	Spent brine injection pipelines: (1) Same as Proposed Action to Wells 55-32 and 65-32. (2) Injection pipeline to Basalt Canyon would be modified the same as production pipeline described above.	None
Pipeline Road Crossings: Where pipelines cross, existing NFSRs and County roads, the pipeline would be constructed underground at the crossing.	Same as Proposed Action	Same as Proposed Action	None

TABLE 2-1 (Continued)
COMPARISON OF PROPOSED ACTION AND ALTERNATIVES

Alternative 1 – Proposed Action	Alternative 2 –Plant Site Alternative	Alternative 3 – Modified Pipeline Alternative	Alternative 4 – No Action
Geothermal Pipelines (cont.)			
Pipeline/Pipeline crossings Areas where geothermal pipelines must cross other pipelines (existing or new), the crossings would be constructed above ground (both pipeline above ground).	Pipeline/Pipeline crossings Areas where geothermal pipelines must cross other pipelines (existing or new), the crossings would be constructed underground (one pipeline underground)	Pipeline/Pipeline crossings Areas where geothermal pipelines must cross other pipelines (existing or new), the crossings would be constructed underground (one pipeline underground)	None
Well Field			
Approximately 6 wells drilled per year until production capacity reached. Western wells 12-25 and 14-25 that were constructed in 2011 would be developed first depending on the results of the well testing. Up to 16 wells could be drilled (production or injection)	Same as Proposed Action.	Same as Proposed Action, with a modification to the location of Well 26-30, which would be moved slightly to the northwest.	Existing exploration and monitoring wells would remain in place. Up to 11 new exploration wells approved previously may be constructed.
Temporary Ground Disturbance and Permanent Impervious Surface Changes[a]			
Approximately 78.3 acres of temporary ground disturbance and 17.3 acres of new permanent impervious surface.	Approximately 83.2 acres of temporary ground disturbance and 18.1 acres of new permanent impervious surface.	Approximately 77.1 acres of temporary ground disturbance and 17.5 acres of new permanent impervious surface.	None
Access Roads[b]			
Access Roads Improve 5.58 miles (8.98 km) of existing roads (4.97miles of NFSR and County roads and 0.61 mile of non-NFSR (unauthorized road)) Construct 0.77 mile (1.24 km) new roads	Access Roads Improve 5.84 miles (9.40 km) of existing roads (5.23 miles of NFSR and County roads and 0.61 mile of non-NFSR (unauthorized road)) Construct 0.77 mile (1.24 km) new roads	Access Roads Improve 5.58 miles (8.98 km) of existing roads, including widening of Sawmill Cutoff Road (NFSR 03S08) Construct 0.87 mile (1.40 km) new roads	None
Road Changes NFSR 03S129E would be closed to public access within the fence line of the proposed CD-IV power plant. NFSRs 03S08N and 03S08P (which are part of Knolls Loop) may be temporarily closed during construction, but would be reopened or rerouted after construction is complete. Other roads and underground crossings may be temporarily closed during construction.	Road Changes No closure of NFSR 03S129E. Would require closure of a portion of NFST 28E207 and the closure and rerouting of a portion of NFSR 03S130. Pipelines required to connect the CD-IV plant to the existing plant would cross several NFSRs roads creating temporary closures (see Figure 4.4-3).	Road Changes Alternative 3 pipelines would cross Knolls Loop and Sawmill Road (03S25) the same number of times as Alternative 1 and result in similar road conflicts. The number of pipeline crossings on other NFSRs would be similar to Alternative 1; however, Sawmill Cutoff Road (NFSR 03S08), which is a signed and groomed winter route, would be crossed once under Alternative 3, rather than twice under Alternative 1	No road changes would be required.

NOTES:

a See Section 4.19, Surface Water Hydrology
b See Table 2-3 for additional details regarding potential road changes.



SOURCE: NAIP, 2010

Casa Diablo IV Geothermal Development Project . **209487**

Figure 2-1
Project Location Map

2.2.1 Project Location

The entire CD-IV Project would be located within the Mono-Long Valley area in Mono County, California.

The CD-IV power plant would be located on National Forest System land; the Forest Service manages the surface estate, and BLM is responsible for management of the subsurface estate through the geothermal leases (BLM Geothermal Lease # CACA-11667). The proposed site is in Sections 29 and 32, Township 3 South, and Range 28 East MD B&M. This location is east of U.S. Highway 395 and approximately 0.5 mile to the northwest of the three existing Casa Diablo geothermal power plants, which are about two miles east of the Town of Mammoth Lakes in Mono County, California (see Figure 2-2). The CD-IV power plant would use geothermal brine flow from the Basalt and Upper Basalt Canyon area. The Casa Diablo Geothermal Complex is an existing facility east of U.S. Highway 395 which contains three operating geothermal power plants and associated facilities such as offices, maintenance buildings and substations.

The CD-IV Project would include construction, operation, and maintenance of geothermal resource wells and pipelines on portions of BLM Geothermal Leases CACA-11667, CACA-14407, CACA-14408 and CACA-11672 located within the Inyo National Forest in Section 25, 26 and 36 of T3S, R27E and Sections 30, 31 and 32 of T3S, R28E, MD B&M. Up to 16 geothermal wells (14 new and 2 existing, drilled previously for exploration) are proposed from 18 possible locations (shown in Figure 2-2). Fourteen of the wells would be located in the Basalt Canyon Area and two wells would be located southeast of the proposed power plant east of U.S. Highway 395. The final number and location of wells will be determined by modeling and actual drilling results.

The main pipeline route for the CD-IV Project would parallel the existing Basalt Canyon pipeline through Basalt Canyon, and would cross under U.S. Highway 395 next to the existing pipeline.

2.2.2 General Construction Information

The following section provides general information related to the construction of project components including the power plant, wells, transmission line and access roads.

Source for Site Building Materials

Aggregate and fill materials would be obtained from an approved source on USFS land and/or material approved by the USFS from local private sources.

Drainage Structures

Site drainage, including finish grades, ditches, swales, and other drainage features, would be designed to meet local weather conditions and appropriate engineering standards. The drainage would be designed to ensure that stormwater runoff would not adversely affect nearby surface waters and would not cause erosion. The plant and well pads would be designed so that spills would be contained on site.

SOURCE: Ormat, 2010; NAIP, 2010; USFS, 2011

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Figure 2-2

Project Layout - Aerial Photograph Base

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Revegetation

The areas disturbed for construction that are not required for operation would be reseeded with native grasses and forbs. The stockpiled topsoils would be spread on these areas to aid revegetation. In some cases, disturbed areas may need to be decompacted, regraded or otherwise treated to prevent alteration of natural drainage.

Source and Quantity of Water During Construction

Up to 25,000 gallons per day (gpd) of water would be required for production and injection well drilling. Water requirements for well pad, road, pipeline, power plant, and substation construction, dust control, and fire protection (all activities other than drilling) would average up to 20,000 gpd. One portable water tank holding a total of at least 10,000 gallons would be maintained in the project area during construction. The USFS may require additional water supply for fire protection following its review of the Special Use Permit application. Two water trucks would be used to transport water to the work sites and would also be used to water roads for dust control. Following is a list of potential water sources:

1. Casa Diablo power plant service water (non-potable shallow groundwater used at the existing Casa Diablo geothermal plants for irrigation and other plant service purposes)

2. Casa Diablo power plant geothermal injection fluid (obtained by diverting a small stream of the geothermal injection fluid to a holding tank and/or directly to water trucks)

3. Mammoth Community Water District (MCMD) reclaimed water (tertiary treated waste water produced from the treatment plant)

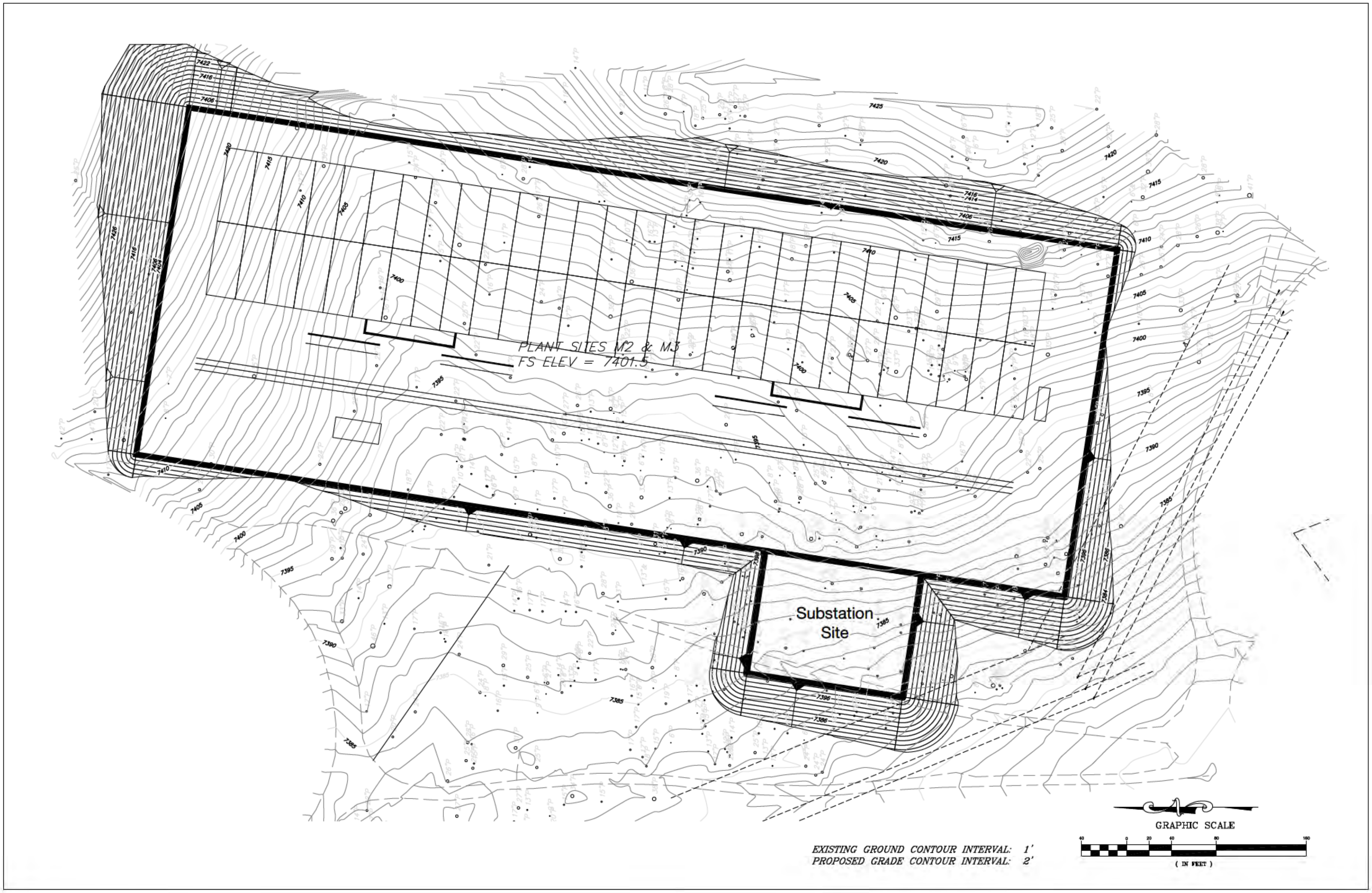
Each of these water sources would be picked up from the source and delivered to the construction location or drilling site(s) by a water truck which would be capable of carrying approximately 4,000 gallons per load.

2.2.3 Power Plant

The proposed power plant and substation would be constructed near the existing geothermal power plant facilities as described in Section 2.2.1 (Figure 2-2). Figure 2-3 shows the proposed layout of these facilities. The power plant would be constructed in two phases. During Phase I, the first OEC system power plant would be constructed on the southern end of plant site. Figure 2-4 shows a profile view of the OEC system. During Phase II, after the wellfield is further developed, the remainder of the plant site would be graded and the second OEC system installed.

2.2.3.1 Existing and Planned Access Roads

Roadways in the vicinity of the CD-IV Project power plant are under multiple jurisdictions. There are roads maintained by Mono County (County-maintained roads), National Forest System Roads (NFSR) under the jurisdiction of USFS, and unauthorized roads that have been created by users. Existing entrances into the Casa Diablo Geothermal Complex would be sufficient to provide access to the proposed CD-IV power plant site. Traffic to the CD-IV plant would come from



SOURCE: Triad/Holmes Associates

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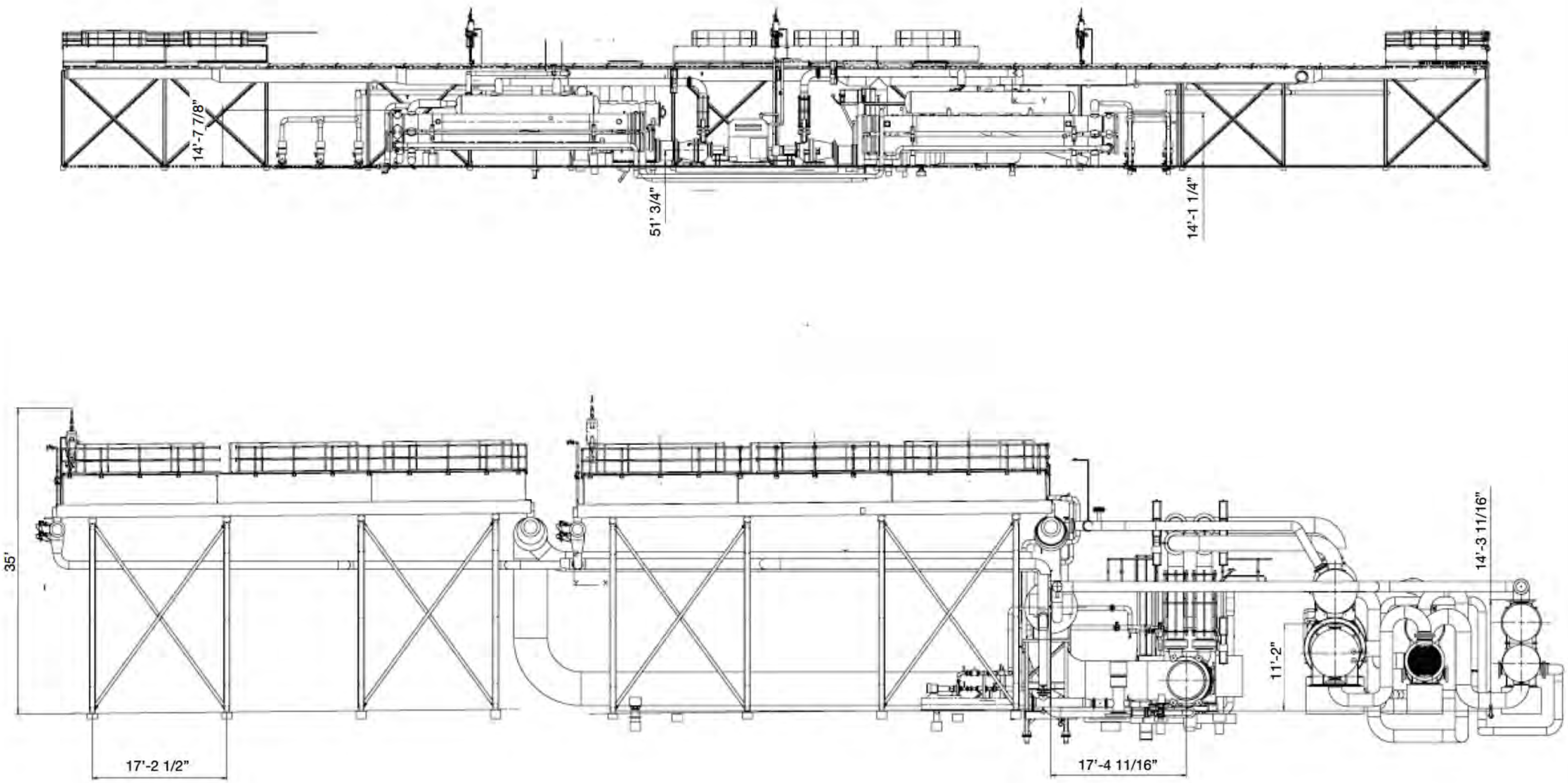
Figure 2-3
Power Plant and Substation View



SOURCE: Ormat

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Figure 2-4
Profile Views of OEC System

U.S. Highway 395, exiting at SR 203 and utilizing existing NFSR 03S129E to access the proposed power plant and substation. Substation Road and the Old Highway 395 would continue to be used as emergency access roads and lead to a locked gate that can be opened by any emergency responders. No new access roads would be required for the CD-IV power plant site. The section of NFSR 03S129E located within the proposed power plant fence line would be closed to public access.

2.2.3.2 Site Preparation and Associated Surface Disturbance

Power Plant

A total area up to 283,500 square feet (6.5 acres) would be cleared of trees (the site is currently forest) and other vegetation and grubbed to remove roots in two phases: 170,932 square feet (Phase I) and 112,568 square feet (Phase II). Following clearing and grubbing, the plant site would be graded based on final site layout plans. The cleared area includes construction laydown areas which would not be part of the plant site. Topsoil would be stockpiled to be used for revegetation of areas not required for operation. According to the preliminary grading plans, 48,680 cubic yards would be cut, 46,190 cubic yards of which would be used as fill material (Triad/Holmes, 2010). Excess excavated material not required as fill (approximately 2,490 cubic yards) would be disposed of or stockpiled at the discretion of the USFS or BLM. All equipment and building foundations would be constructed on native soil (following excavation of several feet of topsoil) or structural fill. Compaction of the soils would be in accordance with the recommendations in the geotechnical report to be conducted prior to ground clearing and the detailed civil design. All disturbed lands not required for power plant operations would be revegetated upon completion of construction. All buildings, insulation jacketing, and visible structures would be painted and textured to blend with the existing environment. The site would be surfaced with gravel after final grading. Grading design would be based on local topography. All equipment would be brought to the project site on trucks. The power plant construction site would be accessed from U.S. Highway 395 and SR 203.

Substation

The substation would occupy a site approximately 100 feet by 80 feet (approximately 0.25 acre) and would be located adjacent to the power plant. The site would be cleared of vegetation and grubbed prior to grading. Similar to the power plant construction, gravel surfacing would be placed after final grading of the site.

Transmission Line

The transmission line connection from the power plant substation to the existing SCE Casa Diablo Substation would be constructed by ORNI 50, LLC contractors. The 33 kV line would be approximately 650 feet long. Prior to construction the alignment would be cleared of trees for an area wide enough (less than 50 feet) for construction equipment access and line clearance. The transmission line would be supported by 3 to 6 poles, approximately 40 feet high.

2.2.3.3 Power Plant General Construction Information

Power Plant

Power plant construction would involve installation of building foundations, equipment assembly, and construction of the plant building. Staging of equipment and materials would be within the site footprint.

Construction equipment needed for site clearing and power plant construction would generally include the following: earth moving equipment such as excavators, graders, loaders, backhoes, compactors, and trucks; materials handling equipment such as crane, concrete mixer, drilling rig, roller; and other equipment including compressor, generator, pump, chainsaws, welder, and fans.

Substation

The substation and switching stations would be constructed as part of the power plant construction. A typical substation layout is shown on Figure 2-5.

Transmission Line

The transmission line would require the installation of approximately 3 to 6 wood or steel poles which would be installed directly into the soil within bored holes that would be approximately 1 to 2 feet in diameter and 8 to 10 feet deep. Once the poles are set in place, excavated materials would be used to backfill the hole. If the excavated materials are not suitable for backfill, imported fill material or concrete would be used. Excess excavated materials would be distributed at each pole site or disposed of off-site in accordance with all applicable laws.

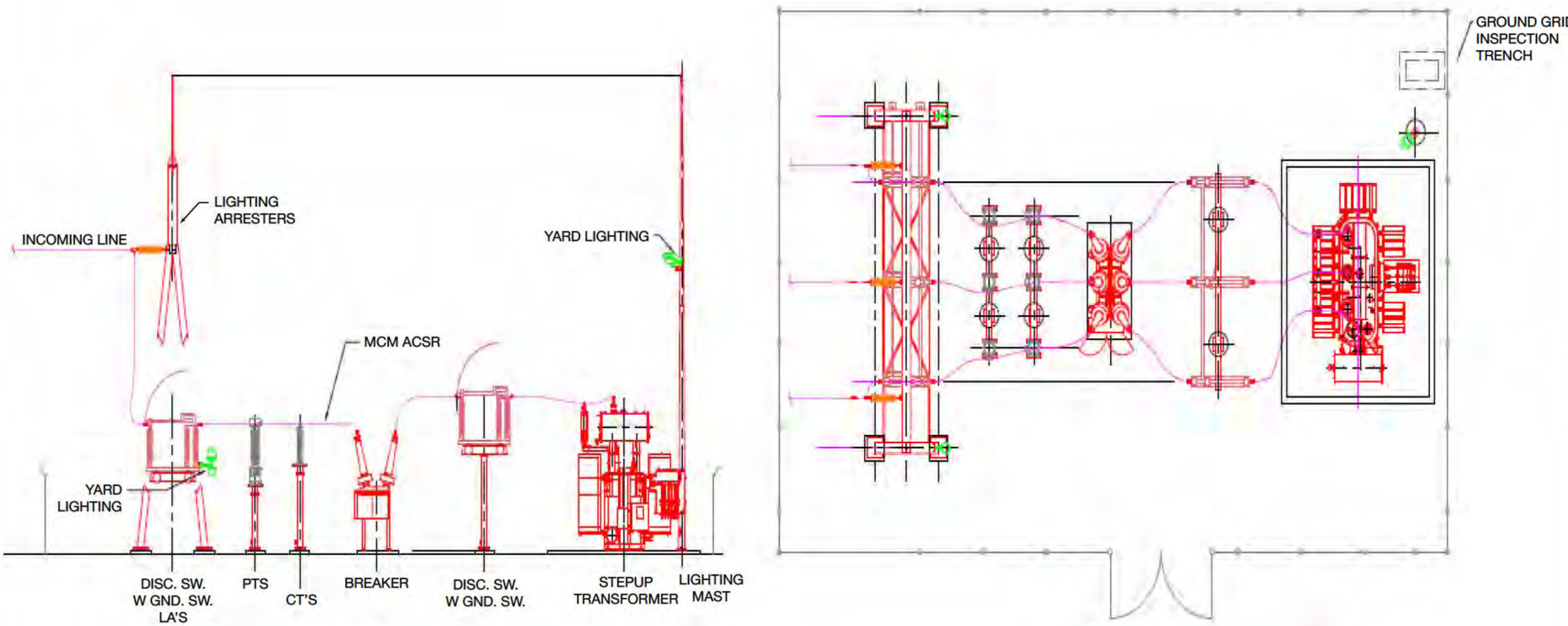
Transmission line poles would be hauled to the plant site or a temporary laydown near pole locations. While on the ground, the poles could be configured with the necessary cross arms, insulators, and wire-stringing hardware before being set in place. A line truck with an attached boom would be used to set the poles into previously prepared holes.

2.2.4 Well Pad and Well Design and Construction

The proposed well pad locations, layout, design and construction methods are described in this section. The actual final well pad layout, design and construction will be determined following site-specific review and approval by the BLM following submittal of the Geothermal Drilling Permit application (Form 3260.2) in accordance with 43 CFR Subpart 3261.10.

2.2.4.1 Well Locations and Status

The 18 potential well locations (for up to 16 production and injection wells) and status are shown in Figure 2-2 and Table 2-2. Previous NEPA analysis (and permit approvals) at several of the well sites has been completed for the drilling of large diameter and slim hole exploratory wells (Table 2-2). The CD-IV project would construct production and injection wells, which are generally the same size as large bore exploratory wells, but larger diameter than slim-hole



SUBSTATION YARD SECTION VIEW
NOT TO SCALE

SUBSTATION YARD DETAIL - PLAN VIEW
NOT TO SCALE

SOURCE: Ormat

Casa Diablo IV Geothermal Development Project . 209487

Figure 2-5
Typical Substation Layout

TABLE 2-2
PROPOSED WELL STATUS AND PREVIOUS NEPA ANALYSIS

Well Identification (ID) Number[a]	General Location	Status/Use	Previous NEPA analysis in 2001[b], 2005a[c], 2005b[d]
12-25	Basalt Canyon	Drilled for exploration during summer of 2010 and 2011	2005a – exploratory
14-25	Basalt Canyon	Drilled for exploration during summer of 2010	2005a – exploratory
15-25	Basalt Canyon	New well (may be production or injection)	2005a – exploratory
25-25	Basalt Canyon	New well (may be production or injection)	2005a – exploratory
34-25	Basalt Canyon	New well (may be production or injection)	2005a – exploratory
38-25	Basalt Canyon	New well (may be production or injection)	2005a – exploratory
50-25	Basalt Canyon	New well (may be production or injection)	No
56-25	Basalt Canyon	New well (may be production or injection)	2005a – exploratory
81-36	Basalt Canyon	New well (may be production or injection)	2001 – exploratory
77-25	Basalt Canyon	New well (may be production or injection)	2005a – exploratory
26-30	Basalt Canyon	New well (may be production or injection)	No
12-31	Basalt Canyon	Slim-hole well, drilled for exploration, used for monitoring; may be re-drilled to be used as a production well.	2001 – exploratory
12A-31	Basalt Canyon	New well (may be production or injection)	No
23-31	Basalt Canyon	New well (may be production or injection)	2001 – exploratory
35-31	Basalt Canyon	New well (may be production or injection)	2001 – exploratory
55-31	Basalt Canyon	New well (may be production or injection)	2001 – exploratory
55-32	Southeast of power plant	New injection well	No
65-32	Southeast of power plant	New injection well	No
Non CD-IV Wells in Basalt Canyon			
57-25	Basalt Canyon	Existing production well – used for MP-1, MP-2 and PLES I geothermal power plants	2005b – exploratory ; authorized for production
66-25	Basalt Canyon	Existing production well – used for MP-1, MP-II and PLES I plants	2005b – exploratory; authorized for production

NOTES:

a Well ID corresponds to Figure 2-2.
b 2001 indicates that construction of the well was analyzed in the Environmental Assessment for the Basalt Canyon Slim Hole and Geothermal Well Exploration Project (BLM, 2001)
c 2005a indicates that construction of the well was analyzed in the Environmental Assessment for the Upper Basalt Geothermal Exploration Project (BLM, 2005).
d 2005b indicates that construction of the well was analyzed in the Basalt Canyon Geothermal Pipeline Project Environmental Assessment and Draft Environmental Impact Report

exploration wells. Large diameter wells would require site-specific review and approval through the Geothermal Drilling Permit. An additional well, 12-31, was also already drilled in Basalt Canyon as a slim hole exploration well and is currently being used as a monitoring well; however, as part of the Proposed Action this well may be re-drilled for use as a production well. Two additional exploration wells (14-25 and 12-25) were drilled during 2010 and 2011, to further delineate the resource. In addition to the three wells just described, up to 13 new wells would be drilled under the Proposed Action. Any wells not used for production/injection would be restored to preconstruction conditions upon completion of well exploration activities.

2.2.4.2 Well Pad Layout and Design

During construction, each well site would be approximately 350 feet by 300 feet (approximately 2.5 acres) to provide access for drilling equipment, mud pits, and a containment basin for drill cuttings. See Figure 2-6 for a typical layout of the well sites during construction. After well construction, each finished well pad area would be approximately 120 feet by 150 feet (approximately 0.4 acres). A completed production well site would contain the wellhead and a small motor control building (approximately 200 square feet) containing the well controls, lubricating oil, and associated equipment. Injection well sites would be similar, but would not include the small pump building. Figure 2-7 shows a typical layout of a completed production well site.

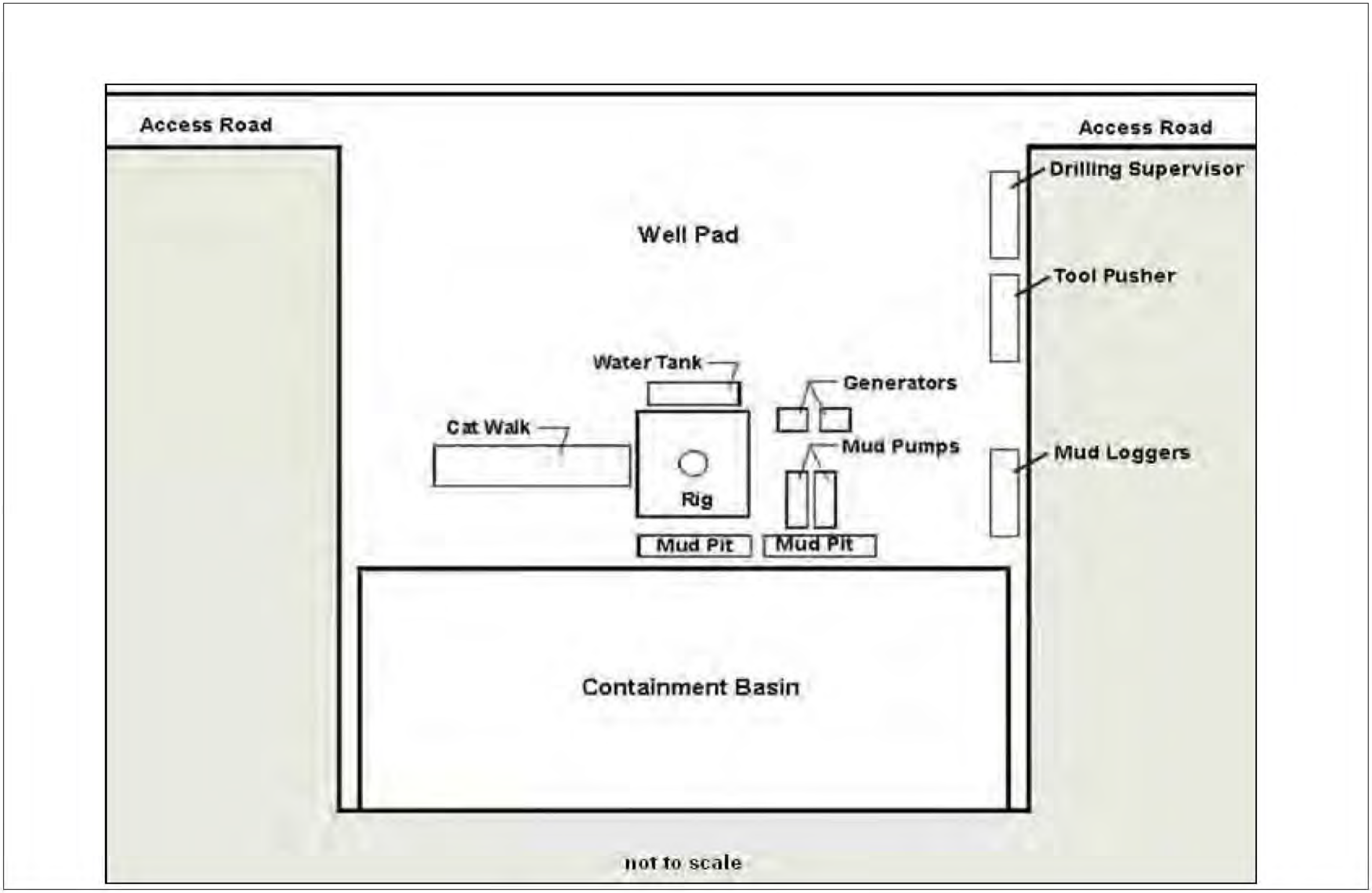
Production wellhead dimensions would not be expected to exceed a height of 15 feet above the ground surface or 4 feet in diameter. An approximately 8-foot by 20-foot by 10-foot high motor control building may be located within approximately 50 feet of each production well (see Figure 2-7). The control building would house and protect the auxiliary well systems; motor switch gear controls and sensors; transmitters for temperature, pressure, flow rate data; and lubricant and corrosion inhibitor (if needed). The wellhead, pump motor, and motor control building would each be painted a color to blend with the area and minimize visibility, using a color scheme as currently used at MPLP’s current facilities in Basalt Canyon.

2.2.4.3 Site Preparation and Associated Surface Disturbance

New production well pads would require vegetation clearing, earthwork, drainage, and other improvements necessary for efficient and safe operation and fire prevention within a 350-foot by 300-foot area (approximately 2.5 acres) for construction. Clearing would include removal of organic material, trees, stumps, brush, and slash. Topsoil would be stockpiled to be used in revegetation of the areas not permanently required for operation. The permanent disturbance area would be approximately 120 feet by 150 feet (approximately 0.4 acres) for the finished well pad. New well pads would then be graded and compacted. Any well site not used for production or injection would be restored to pre-construction conditions upon completion of well exploration activities.

2.2.4.4 Existing and Planned Access Roads

An estimated 5.58 miles (8.98 km) of existing roads would be improved to provide access to the wellfield. As discussed above in 2.2.3.1, existing roads include County-maintained roads, NFSRs, and unauthorized roads. Approximately, 0.61 mile of unauthorized roads would be added to the NFSR to be used as access roads. Sawmill Road (03S25), a County-maintained road, Sawmill Cutoff Road (NFSR 03S08), and Pole Line Road (03S123) are all improved dirt roads that provide general access to the western portions of the wellfield and pipeline route. The rest of the pipeline route and well sites west of U.S. Highway 395 and east of Sawmill Road (03S25) would be accessed through a number of existing NFSR and unauthorized roads. Antelope Springs Road (03S05) and Casa Diablo Cutoff Road would provide access to the eastern portions of the



SOURCE: Ormat

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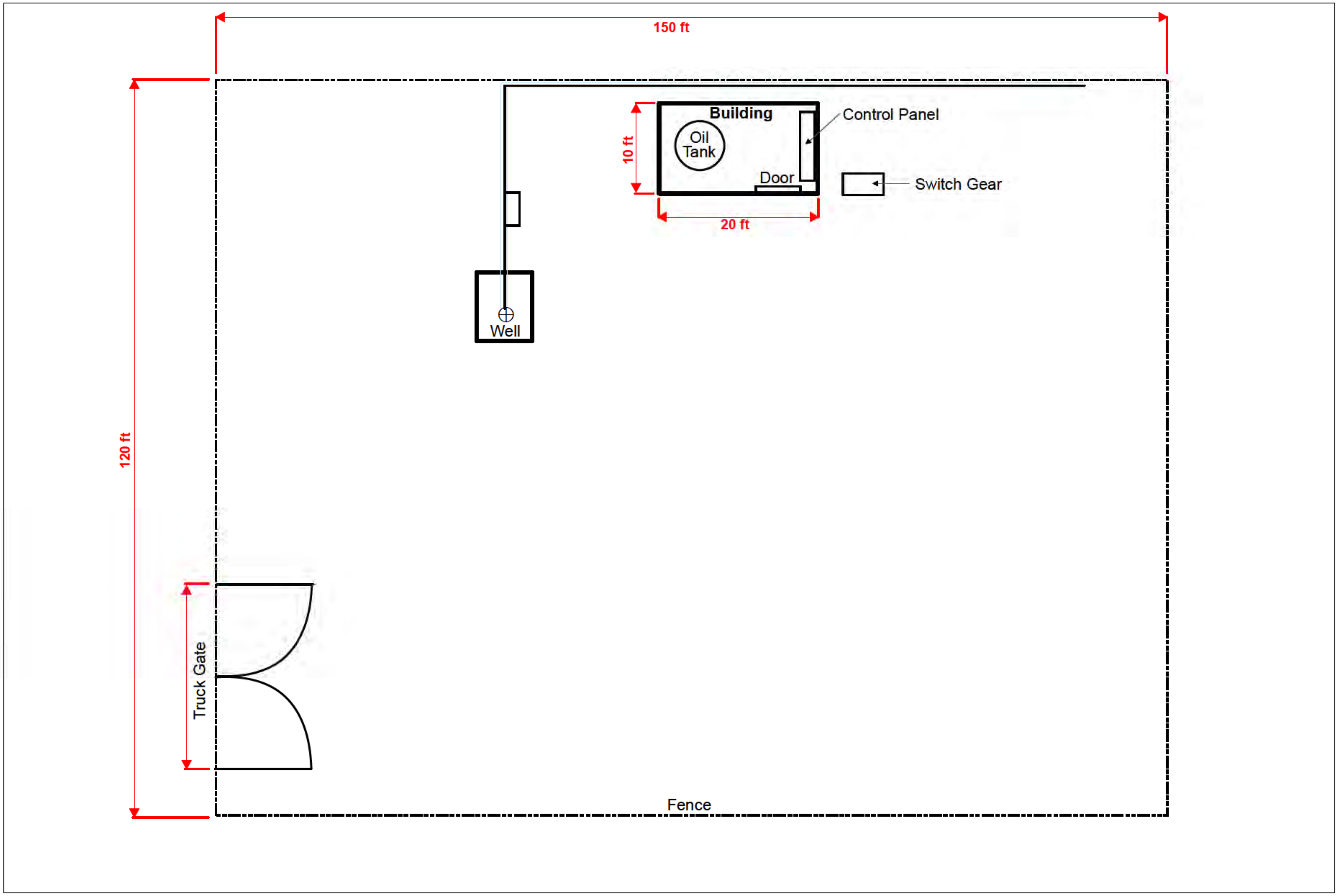
Figure 2-6
Typical Well Pad Layout During Construction



SOURCE: Ormat

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Figure 2-7

Typical Layout of a Completed Production Well Pad pipeline route east of U.S. Highway 395. Wells 55-32 and 65-32 east of U.S. Highway 395 are southeast of the power plants and would be accessed from Old Highway 395, NFSRs, or unauthorized roads. Several new roads would be constructed to provide access to wells. Figure 2-8 shows the location of proposed access roads necessary to construct each well. Depending on the specific well locations, some existing NFSRs and unauthorized roads may be closed temporarily during construction, or permanently following well completion (see Table 2-3 below).

TABLE 2-3
ROAD ACCESS SUMMARY BY CD-IV PROJECT COMPONENT

Project Component	Roads	Description	Proposed
CD-IV Power Plant	NFSR 03S129E	Extends north from Old Highway 395 past the proposed power plant site.	The section of road within the power plant fenceline would be closed to public access.
Well 15-25	NFSR 03S35C	Extends north from Sawmill Cutoff Road (03S08), past Shady Rest Park.	Could be closed, if necessary.
	NFSR 03S35D and NFSR 03S35E	Extends southwest from Sawmill Cutoff Road (03S08), past Shady Rest Park. 03S35D extends from 03S35 E just west of Sawmill Cutoff Road (03S08) and extends northwest.	Access maintained during construction either by avoiding route or temporarily rerouting. Access would be reopened in preconstruction route or permanently rerouted after construction pad is restored to final well pad size.
	NFSR 03S08S	Extends west from Sawmill Cutoff Road (03S08), past Shady Rest Park, north of 03S35E.	Could be closed, if necessary.
Well 26-30	Pole Line Road (NFSR 03S123)	Extends west and south from Shady Rest Park, north of Sawmill Road.	Access would be maintained during construction, which may require rerouting to the east or west of the well pad, depending upon final well pad layout.
Well 34-25	Sawmill Cutoff Road (NFSR 03S08)	Extends northeast from SR 203, past Shady Rest Park.	Access to Sawmill Cutoff Road would be maintained.
	NFSR 03S36	North-south trending route extending from the northwestern edge of Shady Rest Park.	Access would be maintained during construction by either avoiding the road or temporarily rerouting the road. Route 03S36 would be reopened in the preconstruction alignment or permanently rerouted after construction pad is restored to final well pad size.
	NFSR 03S08N and 03S08P	A northeast/ southwest trending road connecting Sawmill Cutoff Road (03S08) to below well 34-25.	These routes may be temporarily closed during construction, but would be reopened or rerouted after construction pad is restored to final well pad size.
Well 50-25	NFSR 03S25J	Extends south from Sawmill Road (03S25), just east of Shady Rest Park.	Access to be maintained, but may require rerouting around the well pad.
Well 56-25	U-N 1134	Existing, unauthorized road connecting well 66-25 to well 56-25.	This road is unauthorized and would be used to access Well 56-25. It would be added to the NFSR network.
Alternative Power Plant Site	NFSR 03S130	A northern trending road extending east and then north from motorized trail 28E207	Reroute NFSR 03S130 around the Alternative CD-IV power plant to maintain through access.
	NFST 28E207	A motorized trail extending north from Old Highway 395, south of the existing Casa Diablo geothermal complex.	May close NFST 28E207.

An estimated 0.77 miles (1.24 km) of new permanent access roads would be constructed from existing roads to the well sites where proposed well pads are not immediately adjacent to existing roads. These new access roads would be 15 feet wide, with a turning radius of no less than 50 feet. Construction of these access roads would be accomplished by clearing brush and grading the surface to construct a roadway; gravel may be added as needed. New access roads constructed or unauthorized routes that are reconstructed would be added to the National Forest Road system. All vehicle traffic associated with the CD-IV Project would be restricted to the designated access roads. To reduce the potential for hazards and to reduce dust generation, project-related vehicles would be restricted to traveling no faster than 25 mph on Sawmill Cutoff Road (NFSR 03S08) and on other unimproved roads in the Project area.

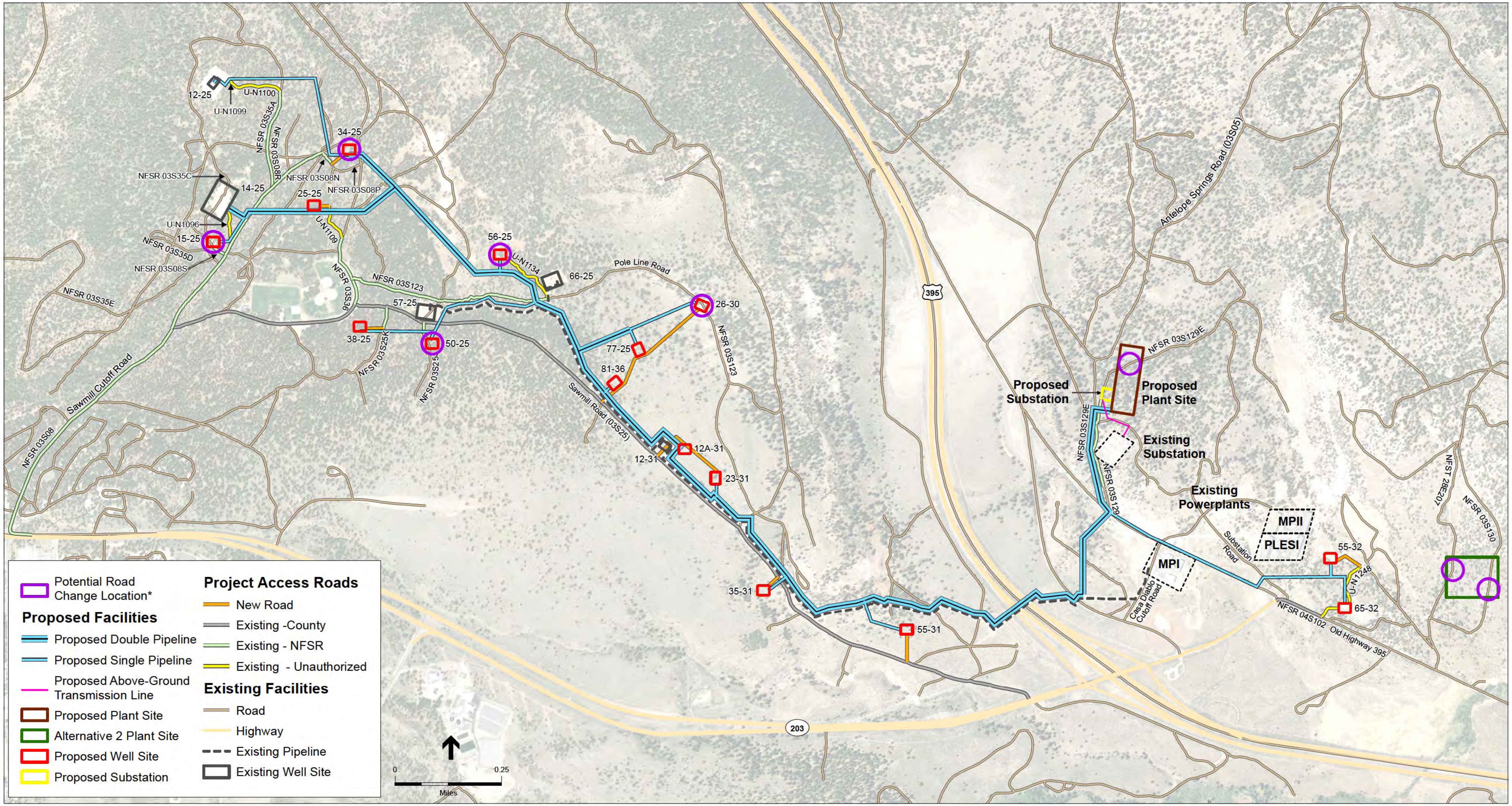
In order to maintain the integrity of the road and minimize erosion, access roads for production wells would be constructed using a durable road surface. In addition, drainage and other road improvements would be constructed, with review and approval by USFS and Mono County, as appropriate. Road base material would be installed and regularly maintained on all production well access roads to accommodate the need for winter plowing. Injection wells do not require year-round access and would not require installation of road base material.

As described in Table 2-3, some existing roads may be closed temporarily or permanently as a result of Project implementation. Roads would be closed at the nearest intersection to avoid creating dead ends. Road closing techniques would mirror USFS travel management implementation strategy – minimal closure techniques used first (disguising of road), barrier, signing. Some roads may require decommissioning (pulling back edges, re-contouring). Fences would not be used to close roads.

2.2.4.5 Well Drilling, Construction and Testing

Geothermal well drilling would be conducted from the well pads described above in accordance with the procedures approved by BLM in the Geothermal Drilling Permit; typical procedures are described in this section. The BLM will be given sufficient notice by the operator (a minimum o f24 hours) to allow all running and cementing of casing strings to be witnessed by their representative. A well pad sump/containment basin would be constructed on each well pad to contain drilling mud and rock cuttings from the drilling operations (Figure 2-6). A Stormwater Pollution Prevention Plan (SWPPP) would be prepared by ORNI 50, LLC for the geothermal wellfield to prevent stormwater and geothermal fluid discharges from the well pads during site construction.

The well bore would be drilled using a rotary drilling rig with non-toxic, temperature stable gel-based drilling mud or gel and polymer drilling fluid to circulate the rock cuttings to the surface, where they would be removed from the drilling mud and captured in the containment basin. The mud would then be recirculated to the drill rig. Additives would be added to the drilling mud as needed to prevent corrosion, increase mud weight, and prevent mud loss. The inside diameter of the wells would be approximately 30 inches (76 cm) at the top and would telescope (narrow) with depth. Each production well would range in depth from 1,600 to 2,500 feet (488 to 762 meters) bgs, and new injection wells would be drilled to approximately



* See Table 2-3 for Road Change Information.

SOURCE: Ormat, 2010; NAIP, 2010

Casa Diablo IV Geothermal Development Project . 209487

Figure 2-8
Project Access Roads

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2,500 feet (762 meters) bgs. Each geothermal well would be drilled and cased to the design depth or the depth selected by a geologist. The final determination of well depth and well completion would be based on geological and reservoir information obtained as wells are drilled.

Drilling operations would take place 24 hours per day, 7 days per week. Each geothermal well would take approximately 60 days to complete.

Following the cementing of the surface casing for the production wells, “blowout” prevention equipment (BOPE) would be installed. The BOPE would be installed, tested, and be ready for use while drilling the well to ensure that any geothermal fluids encountered do not flow uncontrolled to the surface. The BOPE would be installed on the well head (which is welded to the casing) and kept in operating condition and tested in compliance with federal regulations and industry standards. During drilling operations, a minimum of 10,000 gallons (37.9 kiloliters (kl)) of water (in addition to the 10,000 gallon (37.9 kl) tank described previously) and 12,000 pounds of inert, non-toxic, non-hazardous barite (barium sulfate) would be stored at the well site for use in preventing well flow (“killing the well”).

To ensure that the surface casing has been sufficiently cemented to protect fresh water aquifers, a cement evaluation log will be run prior to drilling out the casing shoe. This can be accomplished with a cement bond logging tool, an ultrasonic imager log, or an equivalent cement evaluation tool. The BLM will be given sufficient notice by the operator so the running of the cement evaluation tool can be witnessed by their representative. Upon completion a copy of the log will be provided to the BLM. If the surface casing has not been sufficiently cemented, a squeeze job, top job, or other remedial work as approved by the BLM will be required. All wells will be cased to a depth below the lowest groundwater aquifer to prevent commingling of fluids in the wells.

In the event that very low pressure areas are encountered, compressed air may be added to the drilling mud, or used instead of drilling mud, to reduce the weight of the drilling fluids in the hole and assist in carrying the cuttings to the surface. The air, any drilling mud, rock cuttings, and any reservoir fluids brought to the surface would be diverted through the separator/ rock muffler to separate and discharge the air and water vapor to the air and the drilling mud and cuttings to the reserve pit.

Each production well may need to be worked over or redrilled if mechanical or other problems that prevent proper completion of the well in the targeted geothermal reservoir are encountered while drilling or setting casing, or if the well does not exhibit the anticipated permeability, productivity, or injectivity. Depending on the circumstances encountered, working over a well may consist of lifting the fluid in the well column with air or gas or stimulation of the formation using dilute acid. Well redrilling may consist of reentering and redrilling the existing well bore, reentering the existing well bore and drilling and casing a new well bore, or moving the rig on the same well pad and drilling a new well bore through a new conductor casing. Well workovers or redrilling may also take place during production and operation, as discussed below in Section 2.2.7.5.

In order to maintain maximum sump capacities for future drilling and testing operations, ORNI 50, LLC may choose to separate the drill cuttings from the drill mud prior to their disposal in the sump. Cuttings from drilling operations would be tested by a certified laboratory to confirm they are nonhazardous wastes under Title 22 of the California Code of Regulations prior to disposal. Using the appropriate federal and state hazardous waste testing methods, each sample would be tested for heavy metals, volatile, and semi-volatile organic compounds.

Well Logging

Well logging would be performed in accordance with the Geothermal Drilling Permit approved by BLM. Typically, well logs and surveys would be run during the drilling of any production or injection wells to:

1. Identify any groundwater aquifers which may be present;
2. Determine lithology and geologic structure;
3. Identify zones suitable for production and injection; and
4. Gather data on formation properties during well tests.

A detailed mud log with lithology identification, hydrogen sulfide (H_2S) and carbon dioxide (CO_2) measurements, drilling rates, and mud flow rates and temperatures both into and out of the hole would be maintained during the drilling of each well from the bottom of the conductor to total depth.

Once the reservoir is reached, emphasis would be placed on running temperature, pressure, and spinner (TPS) logs as appropriate. These logs would:

1. Confirm whether the geothermal water entries in the well have adequate temperature;
2. Identify the location of individual geothermal entries;
3. Gather pressure data during well tests with which to calculate reservoir properties; and
4. TPS logs would also be run in injection wells during injection tests as appropriate.

Well Testing

Well testing review and approval is typically handled through a Geothermal Sundry Notice (Form 3260-3) and its terms and conditions. Typical well testing procedures are described below.

Wells would be tested while the drill rig is still over the well. The residual drilling mud and cuttings would be flowed from the well bore and discharged into the drilling sump. This clean-out flow test may be followed by one or more short-term geothermal fluid flow tests, each lasting from several hours to a day and also conducted while the drill rig is over the well. These tests typically consist of flowing the geothermal well into portable steel tanks brought onto the well site while monitoring geothermal fluid temperatures, pressures, flow rates, chemistry and other parameters. Steam from the geothermal fluid would be allowed to discharge to the atmosphere. Produced fluid from the short-term flow test would be pumped temporarily into a tank and then either reinjected into the same well or pumped through a temporary pipe to another holding tank for reinjection into a different well.

An injectivity test could also be conducted by injecting the produced geothermal fluid from the steel tanks back into the well and the geothermal reservoir. The drill rig would likely be moved from the well site following completion of these short-term test(s). Following the short-term test(s), all equipment would be removed and the well shut in. Temperature profiles of the wellbore would be measured during the shut in period.

After the rig has moved, a longer-term test could be conducted using a test facility consisting of approximately ten 21,000-gallon (79.5 kl) steel tanks, injection pumps, coil tubing, nitrogen pumps, filtration units, flow meters, recorders, and sampling apparatus. This test could last for 30 days, during which steam from the geothermal fluid would typically be allowed to discharge to the atmosphere. Similar to the short-term test process, the remaining water would be pumped temporarily into a tank and then either reinjected into the same well or pumped through a temporary pipe to another holding tank for reinjection into a different well.

Non-toxic chemical tracers may be used during production and injection well tests to help establish patterns of communication between production and injection wells. If non-toxic chemical tracers are used for testing, ORNI 50, LLC would also monitor nearby wells for the tracers used in the well tests.

Following completion of the geothermal well testing, all of the drilling and testing equipment would be removed from the site. The surface facilities remaining on the site would typically consist of several valves on top of the surface casing, which would be chained and locked and surrounded by an approximately six foot high 12-foot by 12-foot fence to prevent unauthorized access and vandalism.

Well Drilling and Construction Equipment

Site clearing equipment would include chainsaws, excavators, loaders, graders, backhoes and other standard equipment.

Standard geothermal well drilling equipment would be used for the Proposed Project. The wells would be drilled using a rotary drilling rig whose diesel engines are permitted under the California Air Resources Board (CARB) Portable Engine Registration Program. The wells would be drilled with mud to circulate the drill cuttings to the surface. During drilling, the top of the drill rig derrick would be as much as 175 feet (53.3 meters) above the ground surface, and the rig floor could be 20 to 30 feet (6 to 9 meters) above the ground surface. The typical drill rig and associated support equipment (rig floor and stands; draw works; derrick; drill pipe; trailers; mud, fuel and water tanks; diesel generators; air compressors; etc.) would be brought to the prepared site on approximately 40 or more large tractor-trailer trucks. The placement of this equipment within each prepared site would depend on rig-specific requirements and site-specific conditions.

Drilling equipment would include a mud-rotary drill rig and associated support equipment (rig floor and stands; draw works; derrick; drill pipe; trailers; mud, fuel and water tanks; diesel generators; air compressors; etc). If needed due to low pressure areas encountered during drilling, a separator/rock muffler may be necessary.

Geothermal Well Pumps and Auxiliary Equipment

Each new production well would be equipped with a pump driven by a vertical electric motor located on top of the well pump discharge head. A small, truck-mounted well maintenance rig would install these pumps in the wells. Other small trucks and vehicles would be involved in installing the pump, which is normally conducted only during daylight hours. An electric cable installed along the pipeline from the power plant would provide the electricity to power the well pump motor. Mineral oil would be pumped down from the surface at the rate of one to three gallons per day to lubricate the downhole pump lineshaft bearings. This lineshaft bearing lubrication mineral oil would be discharged into the produced geothermal fluid and eventually injected into the geothermal reservoir. The mineral oil would be less than 0.001 percent (less than 2 ppm) of the volume injected. Some of the production wells may also have scale inhibitor located within secondary containment inside of the motor control building.

Noise measurements collected at the existing Basalt Canyon 57-25 production well provide an estimate of anticipated production well pump noise. The measurements were taken using the A-weighted decibel scale (dBA), which best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. Based on the noise measurements, the representative noise level is 58.3 dBA at 100 feet from the pump (Ormat Inc., 2011).

Neither wellhead pumps nor the auxiliary equipment or motor control buildings would be required at the injection well sites. Instead, injection pumps located at the power plant site would pump the geothermal injection fluid through the injection pipeline system, providing sufficient pressure to inject the cooled geothermal fluid back into the geothermal reservoir.

2.2.5 Geothermal Pipeline Design and Construction

Proposed geothermal pipeline design, routing, access roads and construction are described below. Final design, routing and construction methods would be subject to site-specific review and approval by BLM (Sundry Notice). Conditions of approval specific to the pipeline could be provided by both the BLM and the USFS. At this time, it cannot be predicted which wells are production versus injection wells, so the pipeline design analyzed in this document represents a conservative estimate, final design may result in fewer pipelines.

2.2.5.1 Geothermal Pipeline Design

Geothermal Production Pipeline

The production pipeline would be 8 to 24-inch (20 to 61 cm) diameter welded-steel pipe, essentially identical to several of the pipelines currently used to convey geothermal production fluid to the existing power plants at the Casa Diablo Geothermal Complex. The pipe would be designed, constructed, tested, and inspected pursuant to current industry standards for high temperature, high pressure piping. The exact diameter of the steel pipe would vary depending on the type and amount of geothermal fluid to be conveyed. Once covered with about two inches of insulation (one inch for injection pipelines) and a protective metal sheet (appropriately colored to blend with the area, using the same color scheme as the existing Basalt Canyon pipeline), the overall outside diameter of the finished pipe would range from 12 to 28 inches (30 to71 cm), including insulation. The pipelines would be constructed near ground level (averaging 12 to 18 inches (12 to 46 cm) off the ground) on pipeline supports installed approximately every 20 to 40 feet (6 to 12 meters) along the pipeline routes.

“Expansion loops” would be constructed about every 250 to 500 feet along the production pipeline route so that the pipeline could “flex” as it lengthens and shortens due to heating and cooling. These square bends in the pipeline would typically be horizontal, approximately 40 feet in length by 40 feet (12 meters) in width. Some expansion loops would be vertical, although these would be typically smaller, approximately 15 to 20 feet (4.6 to 6 meters) high. Injection pipelines would have fewer expansion loops.

Geothermal Injection Pipeline

The injection pipeline would parallel the new production pipeline and the existing Basalt Canyon pipeline for much of its route. The injection pipeline would be the same height as the production pipeline, with about 24 inches (61 cm) between the pipelines. Together, the three pipelines would be approximately 12 feet (3.7 meters) wide. The injection fluid pipelines to the injection well sites would be designed as described above for the production pipeline.

2.2.5.2 Pipeline Alignment

The proposed route of the pipeline for transporting the hot geothermal fluid from the production wells to the power plant and from the power plant to the injection wells is shown on Figure 2-2, although the precise alignment of the pipeline could vary slightly depending on final engineering and actual conditions encountered in the field. This pipeline route has been selected to:

1. Gather geothermal fluid from the geothermal well sites with a minimum length of pipeline;
2. Avoid or minimize the effects of construction and operational known environmental issues and/or constraints; and
3. Minimize pipeline visibility from both intermediate and distant viewpoints.

The production pipeline would be routed to connect all the production wells into one main pipeline. The injection pipeline would be routed from the plant to the injection wells. Although the exact length of production and injection pipelines would depend upon which production and injection wells would ultimately be developed, ORNI 50, LLC estimates that the alignment would total approximately 5.7 miles (9.2 km), of which up to 3.5 miles (5.6 km) could consist of double pipeline (two pipelines aligned parallel to each other). The total length of pipeline would be approximately 9.2 miles (14.8 km).

A portion of the project pipeline alignment would be adjacent to the existing Basalt Canyon pipeline. Because some well clusters would be either production or injection, only a single production or injection pipeline would be needed to access certain wells, such as wells 12-25, 15-25, 38-25, 50-25, 57-25 and 26-30. Both the production and injection pipelines would be constructed predominantly above ground with a maximum exterior diameter of 28 inches (71 cm) with the bottom of the pipe averaging 12 to 18 inches (30 to 46 cm) off the ground surface.

Pipeline Road and Pipeline Crossings

Where the pipeline(s) cross existing NSFRs and County-maintained roads, the pipelines would be installed underground (Figure 2-9). In order to prevent snow melt, the underground pipelines would be insulated and a 2 to 4 inch air gap maintained between the insulation and the casing pipe. The top of the casing pipe would be at least 3 to 6 feet (0.9 to 1.8 meters) below grade. In addition, the casing pipe would be insulated by filling the trench with Gilsulate 500 or DriTherm insulation powder. The underground pipe sections would be wide enough to allow for a groomed and a plowed road section, unless USFS determines a groomed section is not required.

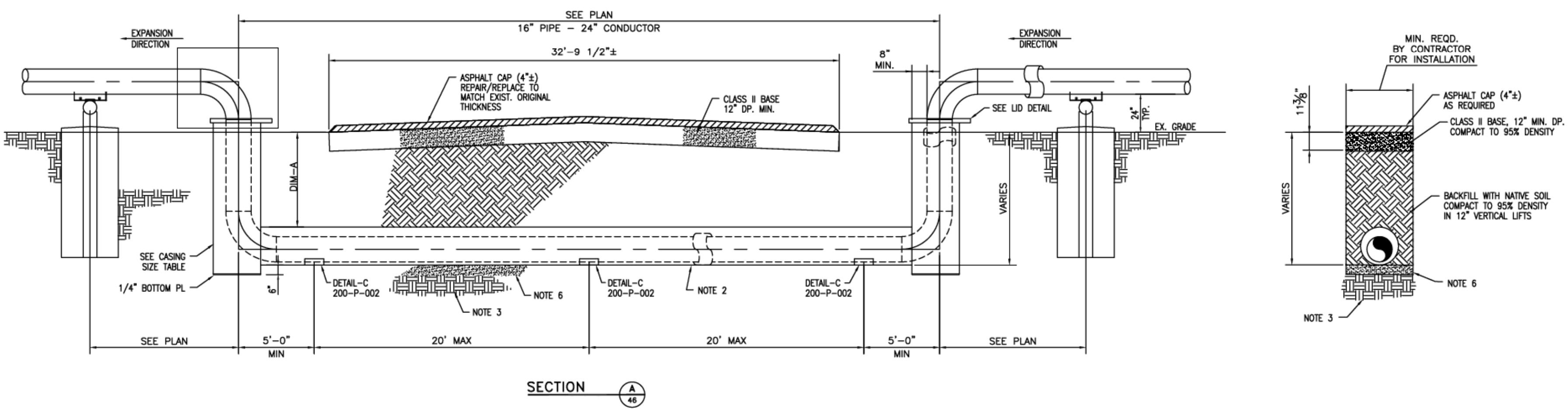
At some locations along the pipeline alignment, in order to access a well pad, the production pipeline would have to cross over the existing Basalt Canyon pipeline, the injection pipeline, or both (similarly, the injection pipeline would require crossovers at other locations). Pipeline crossovers would have square or angled bends in one pipeline to elevate a section, approximately 8 feet long, to cross above the other (Figure 2-10). The maximum pipeline height would be either 5 feet 3 inches (1.6 meters) or 8 feet 6 inches (2.6 meters), depending upon whether angled or square bends are used for the crossover.

2.2.5.3 Pipeline Access

No new permanent access roads for maintenance of the pipeline would be constructed. Where the pipeline is not immediately adjacent to an access road, pipeline construction equipment would “catwalk” over the top of the existing vegetation to avoid the need to grade the pipeline route or create an access road. Catwalking involves using a vehicle with large rubber tires to drive atop the scrub vegetation, which would trample but not remove vegetation. (This method was used to construct the existing Basalt Canyon pipeline.) Vehicle access to these off-road construction areas would be limited to that specifically necessary for construction. No vehicles would be allowed to turn or drive in any area beyond a 40-foot wide temporary construction corridor along the pipeline route. Personal vehicles and vehicles not in immediate use during construction would be parked either on existing well pads or at locations along existing access roads which would not impede continued public access.

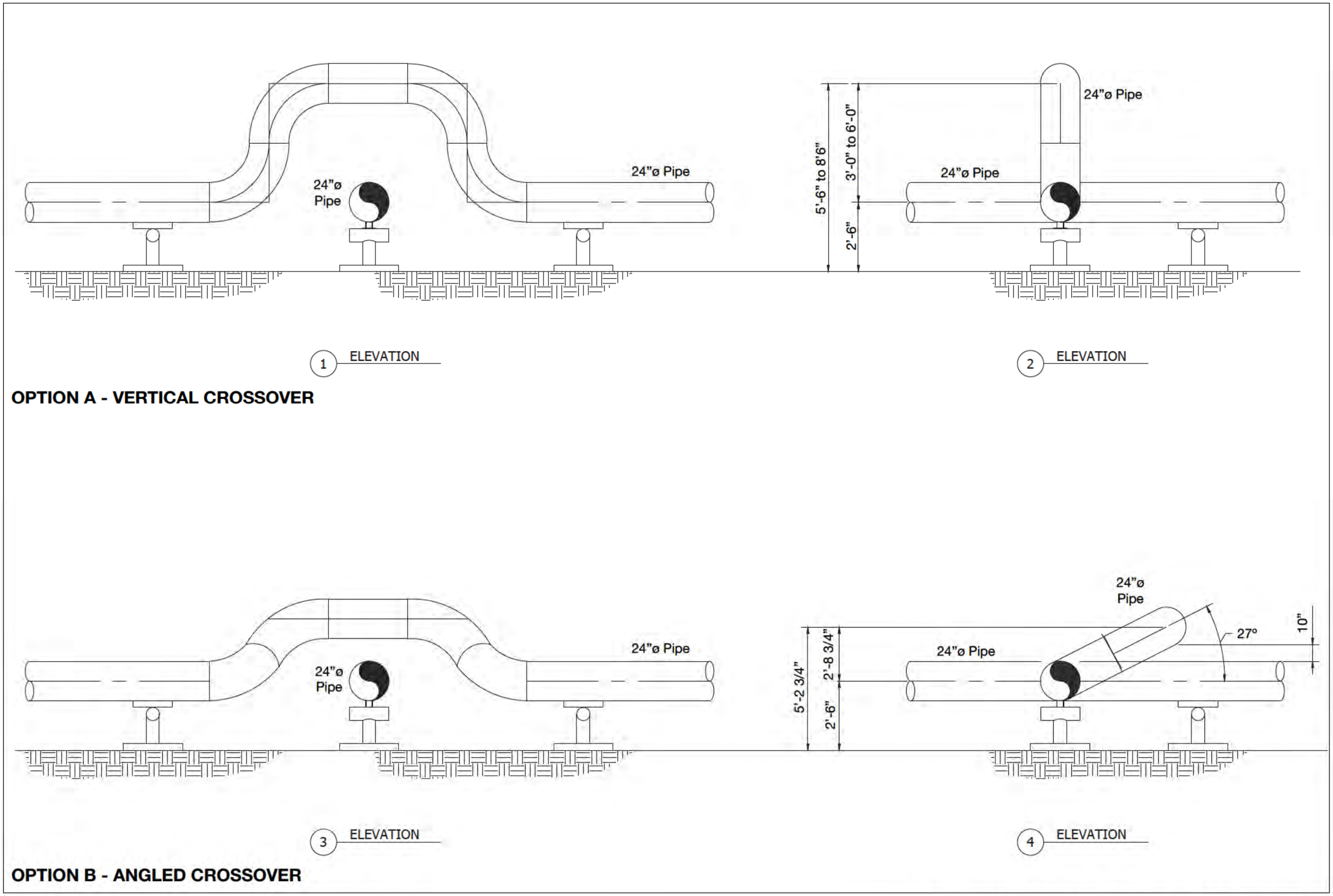
2.2.5.4 Site Preparation and Associated Surface Disturbance

The production and injection system pipeline corridors would use previously disturbed ground along existing access roads to the fullest extent practical. Construction corridors would be less than 40 feet (12 meters) wide, although expansion joints/loops may have a wider corridor. Travel outside the construction corridors would be strictly limited to designated turnout areas and access roads. After construction, the corridor would be revegetated in accordance with an approved USFS revegetation plan, seed mix, and monitoring plan. Vegetation removal on approximately 30 percent of the pipeline construction corridor would be permanent due to pipeline piers, and footings.



SOURCE: JFMPE, Inc.

Figure 2-9
Pipeline Crossover Schematic



SOURCE: JFMPE, Inc.

Casa Diablo IV Geothermal Development Project . 209487

Figure 2-10
Pipeline Crossover Schematic

Pipeline Construction

Pipeline construction would begin by vertically auguring holes in the ground up to 36 inches in diameter at 20 to 40 foot intervals along the pipeline route to install pier supports. Twin holes for two supports may be drilled at the pipeline anchor points, which would be located at the center of each expansion loop and in between each expansion loop. The steel pipe "sleeper"[1] would be placed in the hole and concrete poured to fill the hole slightly above the ground surface. The steel pipe sleeper would extend above the concrete, averaging approximately one foot above ground surface.

While the concrete is curing, the approximately 30-foot long steel pipe sections would be delivered and placed along the construction corridor. A small crane would lift the pipe sections onto the pipe supports and temporary pipe jacks so that they could be welded together into a solid pipeline. Once welded and the welds tested, the pipe would be jacketed with the insulation and the aluminum sheath (appropriately colored to blend with the area). When completed, the top of the new pipeline would average less than three feet above ground surface. Electrical power and instrumentation/control cables for the production well pump motors and valves, and production and injection wellhead instrumentation would then either be installed in steel conduit or cable tray constructed along the same pipe sleepers.

Pipeline Construction at Road Crossings

To allow continued public access along existing National Forest System and County roads which the pipeline must cross, the pipeline would be constructed to cross under existing roads. With the exception of the crossing of U.S. Highway 395, these pipeline road crossings would be constructed by the cut-and-fill method, where a trench up to ten feet deep would be cut through the road, a prefabricated, "U"-shaped oversized pipe sleeve (containing the fabricated geothermal fluid pipeline with the insulation and metal cladding in place) installed in the trench, the excavated dirt backfilled and compacted around and above the oversize pipe sleeve, and the roadbed material repaired or replaced. This construction technique would minimize the time period during which public access along the road would be excluded. For the single-lane dirt roads most common in the area, public access along the road would usually be restricted for only a couple of hours during actual construction. For roads of two or more lanes, cut-and-fill construction would usually be conducted in steps so that only one lane (or one lane in each direction) would be blocked at a time, and public access would not be prevented. However, the road may be temporarily blocked, as it may not be feasible to maintain access if prefabricated U shaped pipeline are used.

The pipeline and accompanying power and control cables would be placed under U.S. Highway 395 by using micro-tunneling procedures that would not result in any disruption to traffic and would avoid any settlement of the road bed. Micro-tunneling would be conducted by specialty contractors using specialized equipment. It involves the installation of an oversize steel casing behind a boring machine that is advanced under the road by "jacking." "Jacking" and "receiving" pits are first excavated and braced at each end of the casing run (i.e., one pit on the east side and one pit on the west side of U.S. Highway 395). The boring machine and casing sections are then lowered into the

[1] A sleeper is a steel framework on which the pipeline would rest.

"jacking" pit and, using specially designed jacks, the boring machine (with casing behind it) is "jacked" under the road. Casing sections are welded together as they are moved forward to form a continuous casing under the road. Once the welded casing is in place under the entire road, the boring machine is removed through the receiving pit and any voids between the casing and the dirt under the road filled with a cement grout under pressure.

2.2.5.5 Geothermal Pipeline Construction Equipment

Equipment used in pipeline construction would generally include trucks, small cranes, concrete trucks, backhoes, forklifts, and welding equipment. Excavators and loaders would be needed to install the pipeline beneath existing access roads. Specialized jack-and-bore equipment would be utilized for pipeline installation beneath U.S. Highway 395.

2.2.6 Construction Schedule

2.2.6.1 Construction Phasing

ORNI 50 LLC proposes that the project be constructed in two phases, pending the results of well drilling and testing. Six wells could be drilled in the first year and, depending upon drilling and testing results, some or all of these wells would be used for geothermal production. It is assumed that sufficient flow would be obtained to operate one OEC system in Phase I, which would provide half of the planned operating capacity (21.2 MW gross). Drilling would continue until sufficient production and injection capacity to support the project has been attained. The second OEC unit would be constructed in Phase II, after additional productive wells have been completed.

During Phase I, the first OEC system would be constructed on the southern end of plant site. About 60 percent of the entire building pad will be graded during Phase I. Pipeline construction would be conducted concurrently with construction of the power plant. During Phase II, after the wellfield is further developed, the remainder of the plant site would be graded and the second OEC system installed. The substation and other necessary structures (electrical building, fire systems, motive fluid storage vessels, and vapor recovery maintenance unit would be built in Phase I only.

2.2.6.2 Schedule of Construction

The power plant, well drilling, and pipeline construction would occur concurrently, in two phases. ORNI 50, LLC has provided the following construction schedule:

1. ***Estimated Construction Start Date*****:** Phase I to begin within the soonest construction season after the permitting process is complete and weather allows. The start date of Phase II is uncertain until further wellfield testing and development has been completed.
2. ***Duration*****:**
    a) *Power Plant* – Construction would require approximately 16 months, pending winter weather and snow conditions, in two phases:

Phase I: 8 months, pending weather condition.
Phase II: 8 months from commencement of this phase, pending weather conditions

b) *Wellfield* – Drilling would be planned for non-winter seasons, June through November (six months). Two drill rigs would be operated during this period. Because it typically takes about two months to drill and install a well, each rig could install three wells during this period, thus six wells would be installed per year. As drilling would continue until sufficient production and injection capacity is reached to support the project, drilling could be completed during the second season. If all 16 wells were needed, two remaining wells would be drilled in the third year.

c) *Pipeline* – The main pipeline would be constructed during one summer season in Phase I, concurrent with Phase I power plant construction. Additional pipelines to new wells would be constructed during Phase II. If all 16 wells were needed, spurs to the two remaining wells would be constructed as needed.

3. ***Testing of well equipment*****:** The wells would be tested for up to 30 days upon completion of each well.

4. ***Testing of the facility*****:** Within 15 months after plant construction begins.

5. ***Start of commercial operations*****:** Within two years after plant construction begins.

2.2.6.3 Personnel Requirements

ORNI 50, LLC estimates that construction would require a peak of up to 120 workers:

Phase I:

1. *Power Plant*: 60 to 80 workers
2. *Pipeline:* 40 to 60 workers
3. *Well Drilling and Well Pads:* 12 to 15 workers

Phase II:

1. *Power Plant*: 60 to 80 workers
2. *Pipeline*: 40 to 60 workers

The average construction work force on site at any given time would range from 10 to 20 workers during low activity periods to 100 to 120 workers during high activity periods. Due to possible overlap in construction work tasks, an estimated peak construction work force of up to 120 workers could be on site periodically during high construction activity periods.

2.2.7 Project Operation and Maintenance

2.2.7.1 Production Program

Production wells would be drilled only to the extent required to operate the proposed power plant. Because the production flow rate from each well is not known at this time, the number of production wells that would be needed is not known. ORNI 50, LLC estimates that there would be about the same number of injection wells as production wells. It is possible that, over the life of the

CD-IV Project, up to 16 wells would be drilled. The locations for these wells would be selected out of the 18 possible locations shown previously in Figure 2-2. The final number and location of wells would be determined by modeling and actual drilling results.

Geothermal fluids would be pumped from the production wells through the collection system to the power plant. Each production wellhead would be equipped with an electrically actuated control valve that would be controlled from the power plant control room. This valve would be selected and designed for maximum reliability, good flow control characteristics, and ability to prevent leakage. Well performance data would be electronically transmitted by telemetry to, and monitored from, the control room. The gathering system would be regulated and controlled inside the plant, primarily though the modulation of the control valve at each well.

Each well control valve would be set and controlled individually by the control room operator through the Programmable Logic Controller (PLC) based Digital Control System (DCS). There would be two basic operational modes for wellfield shut-in via the wellhead control valve, as described below. In addition to the automatic and manual valves at the wells, flow at each well could be stopped from the control room.

In the event of excessive line pressure (the pipeline pressure approaches a predetermined pressure set point), the production flow would need to be reduced. The operator would initially reduce the flow from the wells by turning down the control valves in sequence determined by the operators for the given situation. If further flow reduction becomes necessary, one or all of the wells may be shut-in. The well pad piping pressure rating would be designed to exceed the downhole pump’s maximum output capabilities.

An automatic emergency shutdown would occur in the event pipeline pressure sensors detect either a pressure lower than the low pressure set point, indicating a possible rupture of a line, or a pressure higher than the high pressure set point, indicating a probable operating or maintenance error. The shutdown action would consist of shutting down the pumps and closing the flow control valve located on the discharge of each affected pump.

In the event the automatic shutdown system failed or if, in the opinion of plant operators, an emergency shutdown was required even though the automatic shutdown conditions had not been met, the wellfield could be shut in by the control room operator or well by well in the field.

2.2.7.2 Injection Program

The primary goal of the injection plan is to ensure the longevity and sustainability of the geothermal resource. Ongoing analysis and monitoring would be employed to ensure this goal is met. After the heat has been removed from the geothermal liquid in the heat exchangers, the liquid would flow to the injection wells through an 8- to 24-inch diameter pipeline (plus about 1 to 2 inches of insulation). Injection of this fluid back to the geothermal reservoir would help to maintain reservoir pressure and replenish the reservoir, thereby prolonging the commercial life of the geothermal resource. Fluids would be injected either under vacuum or between 1 and 300 pounds of pressure.

It is likely that, over the life of the project, up to six injection wells would be drilled. The locations for these wells would be selected out of the 18 possible locations shown previously in Figure 2-2. The final number and location of wells would be determined by modeling and actual drilling results.

Each injection well would have manual wellhead isolation valves and regulating valves which would allow injection of the fluids to individual injection wells as required to balance the wellfield and reservoir. Temperature, pressure, and fluid flow at each injection well would be measured and recorded.

During normal operations, the produced geothermal fluid would be confined under pressure as it moves through the power plant and would be injected back into the geothermal reservoir without flashing to steam or being exposed to the atmosphere.

2.2.7.3 Access Road Maintenance and Plowing

Production wells require access year-round. This would require routine maintenance during the summer and regular winter plowing and grooming. Similarly, access to the power plant would require regular plowing in the winter. Injection wells would not require winter plowing. Because it is unknown which wells would be used for production versus injection, it is assumed for this EIS/EIR analysis that all 6.35 miles (10.2 km) of project access roads would be plowed.

The USFS has promulgated Best Management Practices for snow plowing on native surface roads in order to prevent or reduce erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities (See Appendix B). The BMPS have been modified from the "Snow Removal and Storage" Best Management Practice (BMP) (12.21 Exhibit 09, BMP 2.9) from the Soil and Water Conservation Handbook, Chapter 10, Water Quality Management Handbook (R5 FSH 2509.22), to be specific to the CD-IV access roads that would be plowed for year-round access. In this location, there are no surface water or riparian areas, so erosion of the roads and adjacent undisturbed lands is the focus of these recommendations (USFS, 2012).

2.2.7.4 Pipeline Maintenance

Pipeline conditions would be continually monitored by pipeline pressure sensors and automatically reported to plant personnel. In addition, the pipelines would be routinely inspected. Vegetation would be allowed to regenerate; no herbicides would be used. If needed, pipeline repairs would be performed using similar catwalking methods as pipeline construction.

2.2.7.5 Additional Wells and Conversion of Production Wells

As geothermal production and injection wells age they typically produce less and/or cooler geothermal fluid, or inject less fluid, and may need to be redrilled or worked over. Redrilling or reworking a well would require many of the same activities required to drill a new well (see Section 2.2.4.5, *Well Drilling and Construction*). These activities would occur periodically over the life of the project. However, to date, there have been no workovers of existing wells, though there have been enhancements of some wells that were not producing adequately. Pump change-outs would be expected to occur anywhere from every year to every five years.

If a well is judged to have no commercial potential, it may converted to an injection well or to a monitoring well. It would eventually be plugged and abandoned in conformance with the well abandonment requirements of the BLM (Geothermal Resource Operational Order No. 3). Abandonment of either a slim-hole or a geothermal well typically involves plugging the well bore (or hole) with cement sufficient to ensure that fluids would not move across into different aquifers. The well head (and any other equipment) is then removed, the casing cut off well below ground surface, and the hole backfilled to the surface. The well pad and any associated new access road would then be restored in conformance with current USFS surface reclamation requirements. Reclamation typically includes re-grading the affected surfaces to approximate pre-project contours, scarifying the surface to promote revegetation, and re-vegetating with approved native seed mixtures.

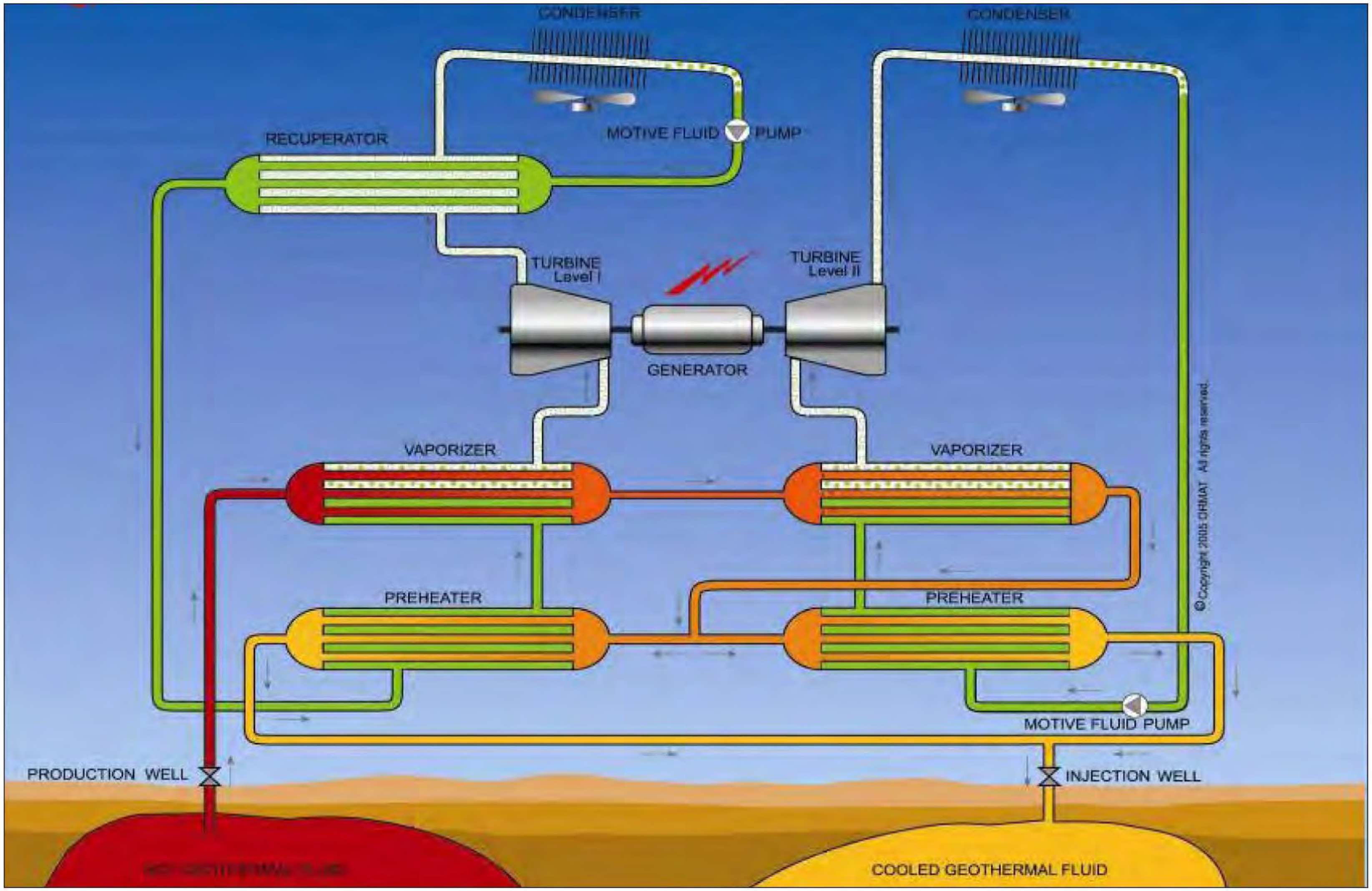
2.2.7.6 Power Plant

Generalized Description

ORNI 50, LLC operates binary technology to extract heat energy from both high and moderate temperature geothermal resources. With this process, geothermal fluids are produced from production wells either by artesian flow or by pumping. Once delivered to the power plant, the heat in the geothermal fluid (called brine) is transferred to the binary (or secondary) fluid in multiple stage non-contact heat exchangers. The geothermal heat vaporizes the working fluid (e.g., n-pentane) which then turns the binary turbine. The vaporized binary fluid exits the turbine and is condensed in an air-cooled condenser system that uses large fans to pull air over the tubes carrying the working fluid, similar to a car radiator only at much larger scale. The condensed binary fluid is then pumped back to the heat exchangers for re-heating and vaporization, completing the closed cycle. The cooled geothermal fluid from the heat exchangers is pumped under pressure to the geothermal injection wells.

Figures 2-3 and 2-4 shows the general arrangement of the proposed CD-IV power plant and profile views of the OEC systems. Figure 2-11 is a simplified flow diagram of the power plant which shows how the two separate fluids (geothermal brine, n-pentane motive fluid) flow through each of the two OEC units. Figure 2-12 shows a photograph of another geothermal plant that CD-IV would somewhat resemble, although the two CD-IV OEC units would be sited end-to-end (lengthwise) rather than side-by-side as illustrated in Figure 2-12.

The proposed CD-IV power plant can be described as having two interdependent operating systems: (a) the geothermal fluid system; (b) the motive fluid system. Each of the two OEC units would be able to operate independently but would share common ancillary components such as n-pentane storage, geothermal brine supply and injection equipment, cooling system, substation, etc. Each of the power plant systems is described below.



SOURCE: Ormat

Casa Diablo IV Geothermal Development Project . 209487

Figure 2-11
Simplified Power Plant Flow Diagram

* Photo is of two units on one site across from each other. CD-IV will be two units together lengthwise

SOURCE: Ormat

Casa Diablo IV Geothermal Development Project . 209487

Figure 2-12
Photograph of Plant Similar to Proposed CD-IV Plant

Geothermal Fluid System

The geothermal fluid system would be a closed loop system. The geothermal fluids from the production wells would be transported to the power plant site and would flow through the level 1 and level 2 vaporizers and preheaters of each OEC unit, transferring the heat to the n-pentane motive fluid through the OEC's shell and tube heat exchangers. The cooled or spent geothermal brine would then be sent to the geothermal brine injection system without coming into contact with the atmosphere.

Motive Fluid System

A light hydrocarbon compound (n-pentane) would be the motive fluid used to drive the turbines for this project. The system works by using the vaporized motive fluid, n-pentane, from the level 1 and level 2 vaporizers to turn the level 1 and level 2 turbines, which together would turn a common generator. The generator would produce the electricity that would be delivered to the project substation and transferred to the interconnection transmission line. The vaporized n-pentane would then be condensed in an air-cooled tube condenser, turning it back into a liquid, and returned to the preheaters and vaporizers to repeat the cycle. Each OEC Unit would contain approximately 180,000 pounds of n-pentane in the vaporizers, preheaters, condensers, piping, and n-pentane vapor vessels (either one or two vessels, likely in the range of 9,000 to 12,000 gallons (34 to 45 kl)). The motive fluid system is closed loop, and there are no routine emissions to the atmosphere. However, there can be fugitive leaks of the n-pentane from pipes, seals, flanges, valves, and other connections and from vapor recovery systems. In addition, small amounts of air or water (noncondensible gases) typically leak into the OEC unit pentane system in the air condensers and accumulate in the loop over time, which eventually reduces the operating efficiency of the system and therefore needs to be purged out of the system. In order to remove the air, each OEC condenser would have several integrated purge units that are also equipped with vapor recovery units (VRU) to capture and recover motive fluid that may be entrained in it. This not only is effective emissions control but also helps to reduce operating costs. Because the motive fluid is expensive, it is economically beneficial to capture and return as much motive fluid to the system as possible.

Each OEC VRU would consist of two chambers and a set of isolation valves. Operation of the OEC VRU would be controlled by the power plant computer control system, which would start the OEC VRU "purge" sequence whenever the efficiency of the OEC Unit falls below a set point. During purging, nearly all of the n–pentane vapors in the OEC VRU would be evacuated from the system and condensed into liquid n–pentane which would then be returned to the OEC units, while air and the small amount of non-condensed pentane vapors would be discharged to the atmosphere. The small amount of n-pentane that is not condensed is included in the emission estimates below.

Some OEC Unit major maintenance activities require that at least a portion of an OEC Unit be cleared of pentane liquid and vapors prior to performing the maintenance activities. To control and minimize pentane emissions during these infrequent major maintenance activities, the liquid pentane would first be drained from the section of the OEC Unit (preheater, vaporizer or condenser) to be maintained or repaired and transferred to either another section of the OEC Unit, the pentane storage tanks, or another OEC Unit. The Maintenance VRU diaphragm pump and vacuum pump would then be used to evacuate and compress most of the remaining pentane vapors, returning the pentane liquid to the other sections of the OEC Unit, the pentane storage tanks, or another OEC Unit. As with the integrated VRUs, this maintenance VRU not only assists with emissions control, but with returning a raw material back to the system to help reduce operating costs.

Based on EPA calculation methods for fugitive leaks from connections and engineering estimates using motive fluid inventory records at similar facilities, Ormat's estimate of these fugitive leaks and emissions from all sources at the 42.4 MW gross CD-IV geothermal project is 411 pounds of n-pentane per day. The vapor recovery devices would return at least 99 percent of the motive fluid back to the system from these units. The VRUs are not only efficient at capturing VOCs, but they are also very effective at capturing and releasing air and water vapor trapped in the motive fluid. This helps to reduce the potential for corrosion of the pipes, seals, valves, and flanges, thus reducing the potential for fugitive leaks from these components.

To help reduce leaks, project operators would frequently inspect the OEC units for visual signs of fugitive n-pentane emissions. Routine leak inspections, monitoring, and reporting would be required as part of the air permit. In addition, as part of the fire and hazard prevention system, pentane-specific vapor sensors and flame detectors would be placed at strategic locations around the turbine, and motive fluid storage tank. These sensors would be connected to the power plant computer control system to immediately alert plant operators to significant leaks.

N-pentane Fire Suppression

Bulk quantities n–pentane would be stored in pressure vessels and bulk storage containers on the power plant site. Numerous engineering, fire–control, and safety measures would be integrated into the Project to prevent releases of n–pentane, prevent fires, and to respond to and control fires and other emergencies. Some of the fire prevention, detection, and control systems that would be included in the design of the CD-IV plant include the following:

1. Safeguards inherent to the design of the power plant would include relief valves, manual and automatic shutoffs; interlocks, vents, and check valves.

2. MPLP would revise its Emergency Response Plan and Risk Management Plan/California Accidental Release Prevention Plan (RMP/CalARP) programs at the existing Casa Diablo facilities to incorporate the CD-IV plant. MPLP staff would continue to receive training on these emergency response programs to help become aware of hazards, prevent incidents, and what to do if an emergency incident should occur.

3. The fire and n–pentane detection systems, as well as fire fighting system, would comply with National Fire Protection Association standards.

4. Normal pentane–specific vapor sensors and flame detectors would be placed at strategic locations around the turbine, motive fluid pumps, and motive fluid storage tank and these would be connected to the power plant computer control system to quickly alert the plant operators to any such potentially hazardous situations. The existing control room itself would not need to be modified, but there would be new controls and monitors for the new plant.

5. An automatic water deluge sprinkler system would be installed on the n–pentane storage vessels (which contain n–pentane in liquid phase) that would automatically activate when a flame detector is activated to cool and protect the vessels.

6. Water nozzles/monitors would be placed at the power plant site to be used to minimize the risk of a fire spreading should one start within the power plant. ORNI 50 would not install or use an automated system because of the operator discretion required to prevent the spread of a flammable liquid fire.

7. For fires involving leaks of flammable gases such as n–pentane, many experts agree that the best method of extinguishment is to isolate the source of the fuel. Refer to the following excerpt from a Material Safety Data Sheet (MSDS) for n–pentane:

    > *The only safe way to extinguish an n–pentane fire is to stop the flow. Cylinders exposed to fire may rupture with violent force. Keep cylinders cool by applying water from a maximum possible distance with a water spray. Avoid spreading burning liquid with water used for cooling.*

    Therefore, automatic fire suppression systems on equipment containing n–pentane would not be used. Instead, manual and automatic shutoffs, interlocks, vents, and check valves, would be the first line of prevention and defense in the event of a fire emergency.

8. All manned/occupied and electrical buildings would have an approved automatic fire suppression system as required by code. The electrical systems would utilize an FM–200® waterless fire suppression system.

9. The water–based fire protection system would include a new fire water storage tank (approximately 340,000 gallons) and a diesel–powered (approximately 400 brake horsepower) fire water pump. Geothermal fluid would be the source of water stored in the fire water storage tank.

10. Fire suppression equipment and tools at the site would include the fire suppression system noted above, fire extinguishers, tools, and mobile equipment.

MPLP worked closely with the Long Valley Fire Protection District to design a system at its existing and proposed Casa Diablo facilities that would meet or exceed its expectations. ORNI 50 will continue to work with the LVFPD for approval of the systems at the CD-IV plant.

Cooling System

The n-pentane vapor condensate would be cooled in tube condensers by air cooling, similar to the existing ORNI 50, LLC plants. The air cooling system would consist of air-cooled condensers including bundles, n-pentane distribution manifolds, fans, motors, and supporting steel. The condenser would be a horizontal air-cooled heat exchanger, which would contain 25 bays. Each bay would have three fans driven by electric motors through a speed-reducing belt drive. Fan blades would be made of aluminum assembled on a shaft, which would be supported by bearings mounted on the condenser frame.

Personnel Requirements

Because the new power plant would be operated collectively with the existing Casa Diablo Geothermal Complex, ORNI 50, LLC estimates that only about six new employees would be required for operation of the CD-IV plant. The six new employees would be onsite approximately 1,800 hours per year.

2.2.7.7 Electrical System

The 42.4 MW gross capacity power plant would be 33 net MW.

Each generator would be provided with a solid-state automatic voltage regulator, main generator circuit breaker, current and voltage transformers, and protective relaying. The generator would produce electrical power at 12.47 kV, which would be stepped up by the main transformer to 33 kV for transmission. The high side of the transformer would be equipped with a gas-filled circuit breaker, motor-operated disconnect switches, protective relaying, and lightning arresters for protection.

Electrical power for the plant auxiliaries operated at 4160 V or 480 V would be supplied through one or more auxiliary step-down transformers. Plant auxiliaries operated at 480 V would be supplied by seven step-down transformers. These transformers would be fed by the 12.47 kV system and would be of the outdoor, three-phase, 60 Hz, oil-immersed type.

Power would be fed from the plant to the production well pads at 4160 V or 12.47 kV through above-ground armored cable in cable trays suspended from the pipelines. At each pad the high voltage power would be fed through suitable switchgear and transformers to the well production pumps. The high voltage power would be transformed to 120/240/480 V for the auxiliary loads to the pads.

The electrical system would have backfeed capabilities in order to supply the facility with power when the plant is down, such as during turbine overhaul maintenance activities.

2.2.8 Project Decommissioning

The expected life of the proposed power plant operation is 30 years, following which all equipment and facilities would be properly abandoned. Decommissioning would include dismantling the power plant and wellfield.

The geothermal wells would be abandoned in conformance with the well abandonment requirements of the BLM. The wells would be plugged and abandoned and the gathering system pipe would be recycled or taken to a landfill or other alternative that may exist at the time. Abandonment of a geothermal well involves plugging the well bore with clean drilling mud and cement sufficient to ensure that fluids would not move across into different aquifers. The well head (and any other equipment) would be removed, the casing cut off at least six feet below ground surface, and the well site reclaimed.

ORNI 50, LLC would prepare and subsequently implement a Site Abandonment-Reclamation Plan that would describe the proposed equipment dismantling and site restoration program in conformance with BLM and USFS requirements. Typically, above ground equipment such as the power plant and pipelines would be dismantled and removed from the site. Some below ground facilities may be abandoned in place. The surface of the site would then be restored to conform to approximate pre-Project land uses.

2.2.9 Project Design Measures for Environmental Protection

As part of the CD-IV Project, ORNI 50, LLC has committed to the following Project Design Measures (PDMs) for environmental protection listed below:

Land Use

1. *LU-1*: All geothermal pipelines potentially visible in scenic highway corridors or important visual areas will be obscured from view to the extent reasonably feasible by fences, natural terrain, vegetation, or constructed berms (consistent with Mono County Conservation/Open Space Element, Goal I, Objective D, Action 1.18).

2. *LU-2*: Geothermal exploration and development projects will be carried out with the fewest visual intrusions reasonably possible (consistent with Mono County Conservation/Open Space Element, Goal I, Objective F).

3. *LU-3*: Prior to operation of the Project, ORNI 50, LLC will prepare a Site Abandonment-Reclamation Plan in conformance with BLM and USFS requirements. When Project operations are complete, ORNI 50, LLC will restore the site to approximate pre-Project land uses according to the plan requirements.

Traffic/Access/Circulation

1. *TR-1*: ORNI 50, LLC will meet Caltrans' encroachment permit requirements in order to construct the pipeline under U.S. Highway 395.

2. *TR-2*: ORNI 50, LLC will maintain Sawmill Road (03S25) and Sawmill Cutoff Road (03S08) during construction operations to ensure that the road beds are equal to pre-construction conditions.

3. *TR-3*: Project vehicles will not block Sawmill Road (03S25) or Sawmill Cutoff Road (03S08) by either waiting or parking on either road.

4. *TR-4*: Where the pipeline will be constructed under existing roads by open trench construction and restricting public access, appropriate traffic control measures will be established to warn traffic of temporary road closures.

5. *TR-5*: For those sections of the pipeline not immediately adjacent to an access road, pipeline construction equipment will "catwalk" over the top of the existing vegetation without removing it to avoid the need to grade the pipeline route or an access road and minimize both ground disturbance and visual impact. Vehicle access to these off-road construction areas will be limited to that specifically necessary for construction. No vehicles will be allowed to turn or drive in any area beyond a 20-foot wide temporary construction corridor along the pipeline route.

6. *TR-6*: ORNI 50, LLC will attempt to work with the Town of Mammoth Lakes and the USFS to plow the road to and the parking lot at Shady Rest Park in the winter to better accommodate recreational traffic and parking for cross-country skiers and snowmobilers. This plan will provide the majority of the winter access for the new well pads proposed for the Project.

7. *TR-7*: All vehicle traffic will be restricted to designated access roads. Project-related vehicles will be restricted to travelling no faster than 25 mph on Sawmill Cutoff Road (03S08) and on other unimproved roads in the project area.

Soil, Geology, Grading, Natural Hazards, Geothermal Resources

Soils and Geologic Resources

1. *GEO-1*: Topsoil will be salvaged, as feasible, and stockpiled (no more than two feet high) for use during subsequent reclamation of the disturbed areas.

2. *GEO-2*: Subsoils will be de-compacted as part of reclamation prior to the replacement of topsoil.

3. *GEO-3*: ORNI 50, LLC will construct the proposed Project in conformance with recommendations by the geotechnical engineer.

Geothermal Resources

4. *GEO-5*: ORNI 50, LLC commits to continuing to operate the existing geothermal projects in conformance with the Plans of Operation for Development, Injection and Utilization, approved by the BLM and USFS, as well as in conformance with monitoring through the Long Valley Hydrologic Advisory Committee, and remedial action programs, which are designed to prevent, or mitigate, potential hydrothermal impacts to the Owens tui chub critical habitat, Hot Creek Hatchery and Hot Creek Gorge springs from geothermal operations conducted on federal geothermal leases in the Mono-Long Valley area. ORNI 50, LLC also commits to operating the proposed geothermal project in conformance with these requirements.

Natural Hazards

5. *GEO-6*: The CD-IV plant will be constructed to handle the maximum credible earthquake in the project area. The power plant and all project construction will comply with Seismic Zone D standards, the most stringent under the International Building Code.

6. *GEO-7*: The CD-IV power plant and pipelines will be designed and constructed to reasonably minimize the potential for failure or rupture in the event of fault offset in these zones.

7. *GEO-8*: The emergency contingency plans will include actions to be taken in the event responsible agencies declare a volcanic hazard warning or alert, or in the event of a volcanic eruption.

Surface Hydrology/Drainages/Erosion Control

Protection of Erosion and Surface Waters

1. *HYD-1*: Appropriate erosion control measures will be used to control any offsite discharges, and the Project will adopt any relevant Lahontan Regional Water Quality

Control Board (LRWQCB) and USFS best management practices to prevent soil erosion, including the preparation of a Storm Water Pollution Prevention Plan.

2. *HYD-2*: To the extent possible, the pipeline route and any access roadways shall be located outside of any riparian conservation areas delineated by the USFS.

3. *HYD-3*: Existing roads will be evaluated and properly graded and repaired in areas that show evidence of enhanced erosion.

4. *HYD-4*: Exposed, disturbed soils in construction areas will be watered to minimize wind erosion and dust. Topsoil piles will be covered to minimize erosion during wind storms. See also AQ-1.

5. *HYD-5*: A site drainage and runoff management plan will be prepared. All new access roads will comply with the plan to minimize erosion and off-site sedimentation. Off-site stormwater will be intercepted in ditches and channeled around the well sites to energy dissipaters as necessary to minimize erosion.

6. *HYD-6*: The pipeline route will not be cleared or graded to minimize soil disturbance.

7. *HYD-7*: The Project will obtain coverage under, and comply with, the California Construction General Storm Water Permit.

Containment of Geothermal Fluids

8. *HYD-8*: The well bores will be cased with steel casing to prevent interzonal migration of the fluids, protect groundwater, and reduce the possibility of uncontrolled well flow (“blowouts”).

9. *HYD-9*: Containment basins/sumps constructed at each drill site for the containment and temporary storage of all drilling fluid, drilling mud and cuttings and stormwater runoff shall be constructed to meet RWQCB requirements. Upon completion of drilling activities, the solids remaining in the pit will be dried and tested in accordance with the requirements of the SWRCB Water Quality Order No. 2003-0003 – Statewide General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality or the project-specific requirements of the LRWQCB and, if authorized by the Regional Water Quality Control Board, USFS and BLM, buried in the pit.

10. *HYD-10*: The power plant site will be constructed to prevent offsite discharge from accidental spills of geothermal fluid, binary working fluid, or other materials stored or used on the site. The plant and well pads will be designed so that spills will be contained on site.

11. *HYD-11*: Isolation valves will be located within the pipeline to prevent any backflow of geothermal fluid, should a pipeline rupture or major leak occur.

12. *HYD-12*: In-line sensing equipment and automatic shutdown controls will be installed to detect pipeline leaks or ruptures and shut in the wells in the event of an electric failure or detected sudden drop in pipeline pressure.

13. *HYD-13*: ORNI 50, LLC shall prepare and implement a “Spill or Discharge Contingency Plan” and “Well Blowout Contingency Plan” to prevent, control, contain, clean up and mitigate the impacts of any large spills of geothermal fluid.

Biological Resources

1. *BIO-1*: A qualified wildlife biologist will walk the pipeline route once each year for the first three years following completion of construction to survey for any signs that the pipeline is impeding wildlife movement. If such evidence is found, the USFS may require ORNI 50, LLC to clear one or more areas under the pipeline of at least 16 inches height, or sufficient to allow wildlife to pass under the pipeline, at the points where movement is impeded.

2. *BIO-2*: After construction is complete, erosion control measures including revegetation and periodic maintenance activities will be implemented. Disturbed areas that will not be used after construction will be revegetated with the proper seed mixture and planting procedures prescribed by the USFS. Any topsoils enriched in organic material stockpiled from previously disturbed areas (see GEO-1) may be applied to enhance areas to be reclaimed by revegetation.

Noxious Weeds

3. *BIO-4*: During construction, prior to entering and upon exiting the Project area, all trucks and construction equipment that will operate off of previously existing roads shall be washed to remove soil and plant parts. A central washing facility will be provided for this purpose, either at the ORNI 50, LLC equipment area at Casa Diablo on private land, or at a location approved by the authorized officer.

4. *BIO-5*: All materials used in erosion control and/or rehabilitation efforts (e.g. straw bales, seeds, etc.) on the Project will be certified as being free of noxious weed materials.

5. *BIO-6*: New non-native species introduced as a result of the Project, will be eradicated (i.e., 0 percent cover). Where this standard is not met, appropriate weed control measures will be implemented in order to comply with the standard for a period of three years following Project completion.

6. *BIO-7*: With the exception of cheatgrass, all non-native weed species already present in the Project area will account for no more than 5 percent total of the relative cover of the disturbed areas, including roadsides at the end of the 3-year evaluation period following completion of revegetation measures. Weed control will be implemented immediately following implementation of the Project, and throughout the Project life to meet this standard.

7. *BIO-8*: Cheatgrass is largely absent from the forested portions of the Project area. In order to maintain this condition, cheatgrass will be removed from all areas where ground disturbance occurs west of drill sites 56-25, 57-25 or 58-25. Appropriate weed control measures will be implemented as necessary, in order to prevent the invasion and spread of cheatgrass, throughout the life of the project, and for a period of three years following Project completion.

Cultural Resources

1. *CUL-1*: All grading and site construction activities will avoid, to the extent possible, all cultural resource sites identified in the cultural resource survey report prepared for the project area. If identified cultural resource sites cannot be avoided, ORNI 50, LLC will comply with all requirements of the USFS and California State Office on

the Historic Preservation (SHPO) prior to any grading or site construction activities which will affect the cultural resources.

2. *CUL-2*: If buried cultural deposits are discovered during site construction activities which were not identified in earlier cultural resource clearances for the project, grading and site construction activities in the vicinity of the cultural deposit will be evaluated by the Inyo National Forest archaeologist, or by a cultural resource specialist pursuant to the requirements of SHPO.

3. *CUL-3*: ORNI 50, LLC employees, contractors, and suppliers will be informed about the sensitivity of the cultural resources in the Project area and reminded that all cultural resources are protected and, if uncovered, shall be left in place and reported to the ORNI 50, LLC representative and/or their supervisor.

Recreation

1. *REC-1*: Sections of the pipeline route not located next to existing roads will be monitored for evidence of use by off-highway vehicles (OHVs). If such evidence is found, ORNI 50, LLC will notify the USFS and comply with its requirements for funding or implementation of actions to prevent use by OHVs, such as the posting of signs and the physical blocking of access.

2. *REC-2*: ORNI 50, LLC will prepare and implement a winter access contingency plan in accordance with the requirements of the USFS. The plan will be designed to ensure that there is at least one location along Sawmill Road which is maintained to provide a safe and easy crossing by cross country skiers.

3. *REC-3*: For public safety, an appropriate temporary fence will be constructed around each drilling sump/pit when the associated drill site is not continuously staffed by personnel and until the pit is backfilled.

   See also TR-6.

Air Quality

1. *AQ-1*: ORNI 50, LLC will apply water during the construction and utilization of pads and access roads as necessary to control dust. Dust will not be discharged into the air for a period or periods aggregating more than three minutes in any one-hour that is as dark or darker in shade as that designated as No. 1 on the Ringelmann Chart.

2. *AQ-2*: ORNI 50, LLC will also comply with any requirements prescribed by the Great Basin Unified Air Pollution Control District (GBUAPCD) concerning emissions of air pollutants from construction engines or hydrogen sulfide from operating geothermal wells. The drilling rigs will be registered in the CARB Portable Engine Registration Program.

3. *AQ-3*: ORNI 50, LLC will utilize best available equipment and design to minimize emissions of n-pentane.

4. *AQ-4*: ORNI 50, LLC will apply for an air permit to construct and operate the wells and power plant. The Project will conform to GBUAPCD requirements for controlling emissions.

Noise

1. *NOI-1*: Mufflers will be used on all drilling rig engines.

2. *NOI-2*: Construction noise will be minimized through operational practices which avoid or minimize those practices which may typically generate greater noise levels, or generate distinctive impact noise.

3. *NOI-3*: Prior to commencing any construction activity associated with the Project, ORNI 50, LLC will submit, and secure the approval of the USFS, a program designed to adequately respond to noise complaints. As part of the program, ORNI 50, LLC will publish a telephone number for use by individuals for the lodging of complaints or inquiries regarding the level of noise from construction operations. A designated representative of the permittee will be available 24 hours a day to record any lodged complaints or inquiries, and ORNI 50, LLC will make reasonable efforts to investigate and respond to any such complaint or inquiry within 24 hours of the complaint or inquiry. ORNI 50, LLC will record each lodged complaint or inquiry, and the results of its investigation and response, on a form, a copy of which will be delivered to the BLM and USFS staff designated to receive these forms within 24 hours of the complaint or inquiry.

Visual/Aesthetics

1. *VIS-1*: Any pipeline route selected within the pipeline corridor will either be located at least 300 feet from the developed portions of Shady Rest Park or will be substantially screened from view from the developed portions of the park by topography or vegetation.

2. *VIS-2*: In sections of the Project area with a USFS Visual Quality Objective (VQO) of “partial retention,” ORNI 50, LLC will, with the approval of the USFS, locate the pipeline so that it is not immediately adjacent to existing roads where possible, and takes advantage of existing vegetation or terrain screening opportunities to reduce the visibility of the pipeline from these roads.

3. *VIS-3*: The pipeline segments to be constructed (a) in areas with a VQO of “retention” in the vicinity of Sawmill Cutoff Road, and (b) in Inyo National Forest managed-land in areas with the VQO of “retention” and visible from State Route 203 and/or U.S. Highway 395 will use texture and color or colors (approved by the authorized officer) selected to blend with the color and texture of the characteristic landscape.

4. *VIS-4*: All power plant and well pad facilities will be painted a neutral color to blend in with the environment, using a color that was approved and used for the existing Basalt Canyon facilities and/or another color scheme approved by the USFS.

Hazards and Hazardous Materials

Hazardous Materials Use

1. *HAZ-1*: ORNI 50, LLC will comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes. Its Hazardous Materials Business Plan will be updated to incorporate the new power plant.

2. *HAZ-2*: N-pentane usage and storage at the CD-IV facility will be incorporated into ORNI 50, LLC’s Risk Management Plan and Process Safety Management program.

Fire Prevention and Control

3. *HAZ-3*: All construction equipment will be equipped with spark arresters. All vehicles will be equipped with fire extinguishers and shovels.

4. *HAZ-4*: Fire extinguishers will be available during all construction activities. Water that is used for construction and dust control will be available for fire fighting.

5. *HAZ-5*: The power plant will have an emergency fire pump to provide water for fire suppression.

6. *HAZ-6*: Cooking, campfires, or fires of any kind shall not be allowed.

7. *HAZ-7*: Personnel will be allowed to smoke only in designated areas, and they will be required to follow applicable Inyo National Forest regulations regarding smoking.

8. *HAZ-8*: Any special permits required for welding or other similar activities will be applied for through, and received from, the District Ranger before these operations are conducted.

Emergency Contingency Plan

9. *HAZ-9*: ORNI 50, LLC shall prepare an emergency plan to provide guidance to field personnel and management in the event of an uncontrolled well flow, pipeline break or other field related emergency. The plan shall address the various hazards or problems that might be encountered and it specify appropriate preventive or anticipatory actions, equipment requirements, as well as specific responses, notifications and follow up procedures in the event of such a field emergency. The plan shall include emergencies such as accidents and injuries.

Environmental Monitoring

10. *HAZ-10*: ORNI 50, LLC and/or its contractors shall conduct daily routine visual inspections of the construction areas during construction to identify and correct any operational problems that could lead to a hazardous materials release. ORNI 50, LLC operators stationed at the Casa Diablo operations center will continuously monitor the well and pipeline operations through the data transmitted to the center by the well and pipeline monitoring sensor. In addition, these operators also conduct regular, routine visual inspections of the well sites and pipeline.

Public Services and Utilities

1. *PSU-1*: Solid waste materials generated during project construction will either be collected by a licensed waste hauler or transported by ORNI 50, LLC and deposited at a facility authorized to receive and dispose of these materials. Portable chemical sanitary facilities will be used by all personnel. These facilities will be maintained by a local contractor.

2.2.10 Mitigation Measures

The following mitigation measures were identified in each resource section contained in Section 4 and summarized here pursuant to CEQ 1502.14 (f):

Air Quality

Mitigation Measure AQ-1: ORNI 50, LLC shall develop and implement a plan that demonstrates that the mobile off-road equipment (more than 50 horsepower) to be used in the Proposed Action (i.e., owned, leased, and subcontractor vehicles) would achieve a Project wide fleet-average 20 percent NO_x reduction compared to the most recent CARB fleet average. The plan shall be approved by GBUAPCD prior to the commencement of construction activities. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or other options as they become available.

Mitigation Measure AQ-2: ORNI 50, LLC shall develop a fugitive dust control plan to be implemented during construction of the Proposed Action. The plan shall be submitted to the GBUAPCD for review and approval prior to the commencement of construction activities. The plan shall include, but not be limited to the following dust control measures:

1. All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized to control dust emissions using water or chemical stabilizer/suppressant.
2. All ground disturbance, including land clearing, grubbing, scraping, excavation, grading, and cut & fill activities shall effectively control fugitive dust emissions by utilizing application of water or by presoaking.
3. Limit traffic speed on unpaved access roads to 15 mph.
4. Suspend excavation and grading activity when gusts produce wind speeds exceeding 20 mph.

Biological Resources

Mitigation Measure VEG-1: ORNI 50, LLC shall undertake the following measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to vegetation resources:

1. ***Limit Disturbance Areas*.** The boundaries of all disturbed areas (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging prior to construction activities. Spoils and topsoil shall be stockpiled in disturbed areas lacking native vegetation that do not provide habitat for special-status species. The stockpiles shall not be placed in areas with existing weed populations. All disturbances, CD-IV Project vehicles and equipment shall be confined to the flagged areas. All personal vehicles shall be parked off-site or at existing MPLP facilities. All above ground pipelines and transmission lines shall be installed using low pressure tracked equipment to minimize impacts on vegetation. Understory vegetation and surface soils may be trampled during pipeline and transmission line installation but not removed. All Jeffrey pine trees in the installation routes outside of the footprint of the power plant site and the well pad sites shall be preserved where feasible. For construction activities outside of the plant site (transmission line, pipeline alignments, well pad sites) access roads, pulling sites, and storage and parking areas shall be designed, installed, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources.

2. ***Minimize Road Impacts***. New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area as described above. All vehicles passing or turning around would do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone, the route shall be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. ***Implement Erosion Control Measures***. Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter "Waters of the State". All disturbed soils and roads within the Project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of disturbed soils (access and staging areas) that slope toward a drainage, shall be stabilized to reduce erosion potential. Water used for dust suppression purposes will not come from Casa Diablo power plant geothermal injection fluids.

4. ***Revegetation of Temporarily Disturbed Areas***. Per PDM BIO-3, ORNI 50, LLC shall prepare and implement a Revegetation Plan to restore all areas subject to temporary disturbance to pre-Project grade and conditions. Temporarily disturbed areas within the Project area include, but are not limited to: the transmission line corridor, construction staging areas for well pad sites, and temporary access roads. The Revegetation Plan shall include a description of topsoil salvage and seeding techniques and a monitoring and reporting plan. The following success standards shall be met at the end of the third growing season following seed application.

    a. Success standards for revegetation in the Jeffrey pine forest are as follows:

        i. At least 1 tree, 1 shrub, and 6 perennial native grasses and/or forbs per 4 square meters will be established on site.

        ii. Perennial grasses will account for at least 10 percent of the relative cover.

        iii. All non-native weed species that are already present in the area will account for no more than 5 percent total of the relative cover at the end of a three year evaluation period. New non-native species introduced as a result of the project will be eradicated (i.e., 0 percent cover).

    b. Success standards for revegetation in the Sagebrush Scrub are as follows:

        i. At least 3 shrubs and 8 perennial native grasses and/or forbs per 4 square meters will be established on site.

        ii. Perennial grasses will account for at least 10 percent of the relative cover.

        iii. All non-native weed species that are already present in the area will account for no more than 5 percent total of the relative cover at the end of a three year evaluation period. New non-native species introduced as a result of the project will be eradicated (i.e., 0 percent cover).

5. ***Landscaping***. Any vegetation planted for landscaping or visual shielding purposes shall be reviewed by USFS and BLM personnel prior to installation.

Mitigation Measure VEG-2: Weed Management Plan. ORNI 50, LLC shall implement a Weed Management Plan that meets the approval of BLM and the USFS. The objective of the

Weed Management Plan shall be to prevent the introduction of any new weeds and the spread of existing weeds as a result of Project construction, operation, and decommissioning. The Weed Management Plan shall include at a minimum the following information: specific weed management objectives and measures for each target non-native weed species; baseline conditions; a map of existing weed populations; weed risk assessment and measures to prevent the introduction and spread of weeds; monitoring and surveying methods; and reporting requirements.

The Plan would be consistent with BLM and USFS practices and would be implemented by ORNI 50, LLC to reduce the potential for the introduction of invasive species during construction, operation and maintenance, and decommissioning of the CD-IV Project. The draft plan would be reviewed and approved by the BLM and the USFS. The following measures are required in the Plan and would be implemented by ORNI 50, LLC to monitor and control invasive species:

1. ***Preventative Measures During Construction.*** Equipment Cleaning: To prevent the spread of weeds into new habitats, prior to entering the Project work areas, construction equipment and personal vehicles shall be cleaned of dirt and mud that could contain weed seeds, roots, or rhizomes. Equipment shall be inspected to ensure it is free of any dirt or mud that could contain weed seeds and the tracks, feet, tires, and undercarriage shall be carefully washed, with special attention paid to axles, frame, cross members, motor mounts, underneath steps, running boards, and front bumper/brush guard assemblies. Other construction vehicles (e.g. pick-up trucks) and vehicles from different areas of the project that frequently enter and exit the site shall be inspected and washed on an as-needed basis. A vehicle log shall be maintained at the washing facility to document vehicle cleaning.

    a. All vehicles shall be washed off-site when possible. Should off-site washing prove infeasible, an on-site cleaning station shall be set up to clean equipment before it enters the work area. Either high-pressure water or air shall be used to clean equipment and the cleaning site shall be situated away from any sensitive biological resources. If possible, water used to wash vehicles and equipment shall be collected and re-used. Before re-using the vehicle wash water, any vegetative matter or soil should be removed.

    b. Site Soil Management: Ground disturbance shall be limited to the minimum necessary for construction activities, using dust suppressants to minimize the spread of seeds. Disturbed vegetation and topsoil shall be re-deposited at or near the removal area to eliminate the transport of soil-borne noxious weed seeds, roots, or rhizomes. Areas of topsoil removal should be surveyed for weeds pre-project. If weeds are present, topsoil should not be re-used for revegetation purposes. BLM-approved dust suppressants (e.g. water and/or palliative) shall be minimized on the site as much as possible, but shall be used during construction to minimize the spread of airborne weed seeds, especially during very windy days.

    c. Weed-free Products: Any use of hay or straw bales on the Project site shall be limited to certified weed-free material. Other products such as gravel, mulch, and soil may also carry weeds and these products, too, shall be certified weed-free. If needed, mulch shall be made from the local, on-site native vegetation cleared from the Project area. Soil shall not be imported onto the Project site from off-site sources.

2. ***Containment and Control Measures*.** When Project monitoring (see below) indicates that invasive species are spreading, invasive species shall be removed using mechanical or manual removal methods. During eradication activities, care shall be taken to have the least effect on native plant species. Chemical control is not included as part of these containment and control measures because site specific information on target weed species are not known at this time.

3. ***Monitoring*.** Baseline weed conditions shall be assessed during the pre-construction phase of the CD-IV Project, during pre-construction surveys and staking and flagging of construction areas. A stratified random sampling technique shall be used to identify and count the extent of weeds on the site.

   Monitoring shall take place each year during construction, and annually for the lifespan of the Project following the completion of construction. The purpose of annual monitoring shall be to determine if weed populations identified during baseline surveys have increased in density or are spreading as a result of the CD-IV Project. With the exception of cheatgrass, all non-native weed species already present in the Project area will account for no more than 5 percent total of the relative cover of the disturbed areas, including roadsides. Control methods shall be implemented when measurable weed increases, as well as visually verified increases, are detected during monitoring.

   General management and monitoring of the Project area shall be conducted by designated site personnel each year during both the germinating and early growing season (November through April) to eliminate new weed individuals prior to seed set. Throughout construction and long-term monitoring, personnel shall be trained to identify weedy and native species and work with a trained vegetation monitor to determine where elimination is necessary.

4. ***Reporting*.** Results of monitoring and management efforts shall be included in annual reports. Copies of these reports shall be kept on file at the site. Copies of each annual report shall be sent to the BLM and USFWS for review and comment. BLM and USFS shall use the results of these reports to determine if any additional monitoring or control measures are necessary.

5. ***Success Criteria*.** Weed control shall be ongoing on the Project site for the life of the CD-IV Project, but plan success shall be determined by BLM and USFS after three years of operations monitoring through the reporting and review process. Success criteria shall be defined as the following:

   a. non-native weed species that are already present in the area shall account for no more than 5 percent total of the relative cover at the end of a three year evaluation period.

   b. New non-native species introduced as a result of the project shall be eradicated (i.e., 0 percent cover).

Mitigation Measure WIL-1: Avoid Active Nesting Season. To avoid and minimize impacts to tree and shrub nesting species, the following measures shall be implemented by ORNI 50, LLC according to the timeframes shown below;

1. If feasible, conduct all tree and shrub removal and grading activities during the non-breeding season (generally September 1 through January 31).

2. If grading and tree removal activities are scheduled to occur during the breeding and nesting season (February 1 through August 31), pre-construction surveys shall be performed prior to the start of project activities.

Conduct Pre-construction Nesting Bird Surveys. If construction, grading or other project-related activities are scheduled during the nesting season (February 1 to August 31), pre-construction surveys shall be conducted prior to the initiation of construction by a qualified wildlife biologist to identify active hawk nests within ½-mile of proposed construction activities and nests of other species within 250 feet of proposed construction activities. The surveys shall be conducted no less than 14 days and no more than 30 days prior to the beginning of each phase of construction. The results of the survey would be emailed to CDFG, USFS, and USFWS at least three days prior to construction. Surveys would be conducted by a qualified biologist in accordance with the following protocols:

1. Surveys for northern goshawk shall include at least two preconstruction surveys (separated by at least two weeks).

2. Surveys for other migratory bird species shall take place no less than 14 days and no more than 30 days prior to the beginning of each phase of construction that would be located within 250 feet of suitable nesting habitat.

If the pre-construction surveys do not identify any nesting raptors or other nesting migratory bird species within areas potentially affected by construction activities, no further mitigation would be required. If the pre-construction surveys do identify nesting raptors or other nesting bird species within areas that may be affected by site construction, the following measures shall be implemented.

Avoid Active Bird Nest Sites. Should active nest sites be discovered within areas that may be affected by construction activities, additional measures shall be implemented as described below, prior to the initiation of construction.

Northern Goshawk and other Migratory Birds**:** If active nests are found, project-related construction impacts shall be avoided by establishment of appropriate no-work buffers to limit project-related construction activities near the nest site. The size of the no-work buffer zone shall be determined in consultation with the CDFG, USFS, and USFWS although a 500-foot buffer would be used when possible. For northern goshawk nests, the buffer should be 1/4 mile. The no-work buffer zone shall be delineated by highly visible temporary construction fencing. In consultation with CDFG, USFS, and USFWS, monitoring of nest activity by a qualified biologist may be required if the project-related construction activity has potential to adversely affect the nest or nesting behavior of the bird. No project-related construction activity shall commence within the no-work buffer area until a qualified biologist and CDFG, USFS, and USFWS confirms that the nest is no longer active.

Mitigation Measure WIL-2: Water which may accumulate in geothermal well site basins from precipitation shall be removed to a standing depth of 2 inches from the respective basins on a daily basis or as soon as operationally feasible; and liquids deposited into the basins shall either be removed daily to a standing depth of 2 inches, or the basins shall be made wildlife escapable by creating earthen ramps at slopes of 1:3 or less at intervals of 100 feet apart or less around the perimeter of the standing depth of the liquid stored in the basin. The basins shall be monitored during well drilling to determine if these measures are effective. If monitoring determines that these measures are ineffective in preventing wildlife from drowning in the basins, an alternative deterrent or escape structure such as netting will be implemented. Alternatives for providing equally effective measures which would allow wildlife to escape unharmed from the well site basins may be authorized subject to USFS, USFS, and CDFG approval.

Mitigation Measure WIL-3: Within the Jeffrey pine forest habitat within the Project area, retain as many snags, downed logs, coarse woody debris and brush piles as possible to provide Sierra marten hunting and denning opportunities.

Mitigation Measure WIL-4: (This mitigation measure only applies to Alternatives 1 and 3) A new deer crossing shall be constructed over the proposed pipeline running south of the power plant site between the existing substation and the existing MP-I power plant to enhance mule deer and other wildlife movement through the Project area. The new crossing will be designed with input from the CDFG but will resemble the existing crossing at the SCE easement.

Mitigation Measure WIL-5: The proposed pipelines running parallel to the existing Basalt Canyon pipeline shall be installed underground in alignment with the existing underground sections in order to provide a clear visual corridor for migrating deer. The underground sections shall be a minimum of 30 feet in length. In most cases these segments occur at existing roads, which mule deer habitually use for movement. Segments that are parallel to the existing Basalt Canyon pipeline in areas where there are currently no underground segments shall be installed underground at a prescribed frequency. These underground segments shall be located in alignment with suspected traditional migratory routes (see Figure 4.4-1). At this time, constructing underground segments in the existing Basalt Canyon pipeline is not proposed, as deer readily pass over the single pipeline. In addition to these underground segments, overhead pipeline segments shall be installed at high movement areas identified to the immediate south of Highway 395 and between well pad sites 57-25 and 66-25 (see Figure 4.4-5). These overhead segments shall be of sufficient height to allow wildlife to pass under the pipeline. It should be noted that these proposed migratory crossing requirements should be viewed primarily as conceptual and should be used to guide final design of the pipelines.

Mitigation Measure WIL-6: ORNI50, LLC shall prepare and implement a Migratory Deer Monitoring Plan that meets the approval of BLM and USFS. The objective of the Migratory Deer Monitoring Plan shall be to monitor the pipeline routes for evidence of movement corridors not currently identified. The migratory deer monitoring shall follow the methodology used for the deer track crossing studies performed in 2011 (Paulus 2011a; 2012a; 2012b). If previously unidentified movement corridors are found during monitoring, remedial actions, such as installation of earthen ramps over the pipeline, shall be implemented in order to facilitate deer crossings.

Mitigation Measure WIL 7: ***Conduct Pre-construction Sage-Grouse Lek Surveys*****.** If construction, grading or other project-related activities are scheduled during the breeding season (February 15 to May 1), pre-construction surveys shall be conducted prior to the initiation of construction by a qualified wildlife biologist to identify sage-grouse leks and nests within ½-mile of proposed construction activities. The surveys shall be conducted no less than 14 days and no more than 30 days prior to the beginning of each phase of construction. Survey protocols shall be approved by the CDFG, USFS, and the USFWS in advance of field surveys. If the pre-construction surveys do not identify any sage-grouse leks within areas potentially affected by construction activities, no further mitigation would be required. If active leks are found, project-related construction impacts shall be avoided by establishment of appropriate no-work buffers to limit project-related construction activities near the lek site. The size of the no-work buffer zone shall be determined in consultation with the CDFG, USFS, and USFWS, although a 500-foot buffer would be used when possible. The no-work buffer zone shall be delineated by highly visible temporary construction fencing. In consultation with CDFG, USFS, and USFWS, monitoring of lek activity by a qualified biologist may be required if the project-related construction activity has potential to adversely affect the lek or mating behavior of the sage-grouse. No project-related construction activity shall commence within the no-work buffer area until a qualified biologist and CDFG, USFS, and USFWS confirms that the lek is no longer active.

Climate Change

Mitigation Measure GHG-1: ORNI 50, LLC shall put forth a good-faith effort to obtain hermetically sealed circuit breakers and gas insulated switches for all SF_6-containing equipment that would be associated with the CD-IV Project.

Cultural Resources

These project-specific mitigation measures presented below shall be applied to mitigate impacts under CEQA and shall be coordinated through the Section 106 process.

Mitigation Measure CUL-1: A Memorandum of Agreement (MOA) shall be prepared and shall detail: 1) procedures to resolve adverse effects under Section 106; 2) coordination between the CEQA process and Section 106 compliance; 3) procedures for treatment of inadvertent discoveries; 4) procedures for determining treatment and disposition of human remains; 5) compliance monitoring; 6) dispute resolution; 7) development of an Historic Properties Treatment Plan; and 8) Tribal consultation and participation. Resolution of effects to cultural resources eligible for or listed in the National Register may include research and documentation, development of an Historic Properties Management Plan, data recovery excavations, curation, public interpretation, use or creation of historic contexts, and report distribution.

Mitigation Measure CUL-2: On the basis of preliminary National Register eligibility assessments made under the MOA, particularly concerning contributing resources to the Casa Diable Obsidian Nation Register District, the USFS and BLM may require the relocation of project components to avoid or reduce damage to cultural resource values. Where operationally feasible, potentially National Register-eligible resources shall be protected from direct project impacts by project redesign within previously surveyed and analyzed areas.

Mitigation Measure CUL-3: The CD-IV Project Alternative 3 design of September 19, 2012, was in part developed to avoid historic properties. Where the USFS and BLM decide that National Register-eligible or -listed cultural resources cannot be protected from direct impacts by project redesign, ORNI 50, LLC shall comply with appropriate mitigative treatment(s) that will be detailed in the MOA.

Mitigation Measure CUL-4: A HPTP shall be developed and included in the MOA that defines and maps all known cultural resources within 150 feet of the project APE. The HPTP shall also detail how resources will be marked and protected as Environmentally Sensitive Areas during construction. The HPTP shall define any additional areas that are considered to be of high-sensitivity for discovery of buried significant cultural resources, including burials, cremations, or sacred features. This sensitivity evaluation shall be conducted by an archaeologist who meets the Secretary of the Interior's Standards and who takes into account geomorphic setting and surrounding distributions of archaeological deposits. The HPTP shall detail provisions for monitoring construction in these high-sensitivity areas. It shall also detail procedures for halting construction, making appropriate notifications to agencies, officials, and Native Americans, and assessing register-eligibility in the event that unknown cultural resources are discovered during construction. For all unanticipated cultural resource discoveries, the HPTP shall detail the methods, consultation procedures, and timelines for assessing register-eligibility, formulating a mitigation plan, and implementing treatment. Mitigation and treatment plans for unanticipated discoveries shall be approved by the USFS, BLM, and the SHPO prior to implementation.

Mitigation Measure CUL-5: Archaeological monitoring shall be conducted by a qualified archaeologist familiar with the types of historic and prehistoric resources that could be encountered within the APE, and under direct supervision of a principal archaeologist. All cultural resources personnel will be approved by the BLM and USFS. A Native American monitor may be required at culturally sensitive locations specified by the USFS following government-to-government consultation with Indian tribes. The HPTP shall indicate the locations where Native American monitors will be required and shall specify the tribal affiliation of the required Native American monitor for each location. ORNI 50, LLC shall retain and schedule any required Native American monitors.

Mitigation Measure CUL-6: Prior to construction, the BLM will ensure that the boundaries of historic properties for which project facilities appear to overlap is clearly marked on the ground with wood lathe and flagging set no more than 10 meters apart. Historic properties planned for avoidance and protection shall be designated as Environmentally Sensitive Areas (ESAs). Historic properties that are within 20 meters (65 feet) of the Direct APE will be identified and labeled as ESAs on engineering plans. ORNI 50, LLC will retain a qualified archaeologist to conduct mandatory cultural sensitivity training for all project staff and contractors prior to construction activities associated with this undertaking.

Mitigation Measure CUL-7: In the event of inadvertent discoveries during construction, operation and maintenance, or decommissioning, procedures outlined in the MOA and the HPTP shall be adhered to. At a minimum this shall include: 1) stop work orders in the vicinity of the find' 2_ recordation and evaluation of the find by a qualified archaeologist' 3) notification of the find to BLM and USFS; 4) and implementation of appropriate treatment measures, such as avoidance or data recovery.

Mitigation Measure CUL-8: Following language developed in the MOA, the BLM shall continue to consult with Indian tribes to identify sacred sites, properties of traditional religious and cultural importance, and traditional use areas that might be affected by the

CD-IV Project. If such places are identified, the BLM will consult further with tribes to resolve access impediments or other identified impacts.

Geothermal Resources

Geologic, Soil and Mineral Resources

Mitigation Measure GEO-1: ***Soil Erosion Control Plan Review and Approval*.** Project design measures HYD-1, HYD-3, and HYD-5 should be reviewed and approved by a USFS watershed specialist before implementation. Erosion control and drainage plans for new and existing roads to be utilized for the project shall be aimed at maintaining to the greatest extent feasible the soil quality objectives contained in the USFS Pacific Southwest Region (Region 5) Watershed and Air Management Manual (Supplement R5-2500-50-2012-1). In developing the plan, ORNI 50, LLC and/or its contractor shall consult with the USFS to determine the appropriate soil quality objective(s) to be met following construction (for temporary construction disturbances), and following decommissioning (for total site restoration). As part of the erosion control and drainage plans, ORNI 50, LLC and/or its contractor shall implement an appropriate combination of BMPs, selected from the USFS Water Quality Management Handbook (R5 FSH 2509.22, Chapter 10, Amendment 2509.22-2011-1), that are necessary to meet or exceed the applicable soil quality objective(s) (i.e., maintain or enhance soil quality and function).

Mitigation Measure GEO-2: ***Soils and Geotechnical Investigation*.** Prior to issuance of a grading permit or use permit, a qualified California-licensed geotechnical engineer shall prepare and submit to the USFS a final geotechnical investigation that provides recommendations to address seismic safety, including determination of the appropriate IBC Seismic Performance Category for the site, and design requirements for foundations, retaining walls/shoring and excavation. The scope of the geotechnical report shall include the proposed plant site as well as the pipeline route and well sites. The geotechnical investigation shall identify and evaluate the presence of expansive, compressible or liquefiable soils and, if present, shall make recommendations for site preparation or design necessary to avoid or reduce adverse structural impacts. Structural foundations shall not be founded on engineered fill, nor on native soil, unless it is demonstrated that the soils would be adequate to support the foundation. A California-licensed geotechnical engineer shall be retained by ORNI 50, LLC to be present on the project site during excavation, grading, and general site preparation activities to monitor the implementation of the recommendations specified in the geotechnical investigation. When/if needed, the geotechnical engineer shall provide structure-specific geologic and geotechnical recommendations that shall be documented in a report approved by the permitting agency.

Mitigation Measure GEO-3: ***Subsidence Monitoring and Mitigation*.** The existing hydrologic monitoring program conducted by the USGS will be reviewed by the USGS and all LVHAC members to ensure adequate monitoring is conducted for the CD-IV project. Based on recommendations by the USGS and LVHAC members, the monitoring program will be expanded to include additional monitoring in the CD-IV Project area and any areas outside the project area that may be impacted by the expanded geothermal development. The monitoring plan will include subsidence and uplift tolerances for potential impacts to infrastructure and resources, and shall include an action plan (e.g., require discontinued or reduced pumping rates) in the event tolerances are exceeded. Additional monitoring may include but is not limited to: drilling additional monitoring wells, installation of new or updated monitoring equipment, monitoring additional thermal and non-thermal springs, monitoring of shallow groundwater wells, monitoring of additional geothermal wells, geochemical analyses, fumarole monitoring, and use of current methods that can detect small-scale changes (for example utilizing InSAR data or high precision leveling methods).

Mitigation Measure GEO-4: ***Surface Fault Rupture Hazard Investigation*****.** ORNI 50, LLC shall include in PDM GEO-7 a requirement to provide the USFS the results and findings of the surface fault rupture hazard investigation and demonstrate that such findings have been incorporated where necessary into the final layout and design of the proposed project. The Surface Fault Rupture Hazard Investigation shall conform to California Geological Survey *Note 49, Guidelines for Evaluating the Hazard of Surface Fault Rupture* (CGS, 2002) and shall be prepared and certified by a California-licensed geotechnical engineer.

Grazing, Wild Horses and Burros

Mitigation Measure GRZ-1: To facilitate livestock management, upon submission of the Facility Utilization Permit, the USFS Authorized Officer would review the affected grazing allotments and recommend appropriate locations for additional under-crossings, if any, in any continuous segment of above-ground pipeline extending one-half mile or longer.

Mitigation Measure GRZ-2: The USFS may seek reimbursement from the geothermal lessee for the permanent loss of 15.3 acres of grazing habitat and for the costs of implementing the livestock escape management plan if it is demonstrated that the lessee's Project operations directly result in stray livestock. The USFS Authorized Officer would coordinate with the Term Grazing Permittee to mitigate the loss.

Land Use

None required.

Noise

None required.

Population and Housing

None required.

Public Safety, Hazardous Materials and Fire

Mitigation Measure PHS-1: ORNI 50, LLC shall prepare emergency contingency plans, including a Spill or Discharge Contingency Plan, a Hazardous Gas Contingency Plan, and an Injury Contingency Plan, and submit these plans for technical review to the USFS, the BLM, the LVFPD, and the MLFPD prior to construction. The Spill or Discharge Contingency Plan shall be designed to apply to spills or other releases at all proposed facilities where potential water quality pollutants would be utilized or stored, including proposed geothermal fluid pipelines, the power plant, the substation, and other proposed facilities where fuels, oils, and other chemicals may be stored or utilized. In consultation with the local agencies, the BLM and USFS will determine any additional measures that shall be included in the emergency contingency plans and these measures shall be implemented by ORNI 50, LLC. The emergency contingency plans shall include, but not be limited to, the following:

1. Identification of blowout prevention equipment and emergency containment equipment that shall be maintained and readily accessible at all times. Equipment could include construction equipment, water trucks, tanks, and absorbents.

2. Specific procedures to shut-in or control the flow, and appropriate control procedures if the means to control the flow is lost.

3. Specific procedures and equipment to construct sumps, dikes and contain flows, spills or leaks of geothermal fluid, drilling mud, and petroleum products.

4. Hazardous gas monitoring, action levels, and emergency procedures.

5. Identification of emergency response providers and appropriate regulatory agencies to be notified in the event of an emergency.

6. Training of all site personnel and construction workers in emergency contingency procedures described in the plans and maintenance of records of worker training.

Mitigation Measure PHS-2: ORNI 50, LLC shall prepare a Fire Protection and Prevention Plan for construction, operation, and maintenance activities. The Fire Protection and Prevention Plan must be submitted to and approved by the Inyo National Forest, the LVFPD, and the MLFPD prior to construction. In consultation with the local agencies, the USFS will determine any additional BMPs that shall be implemented. The Fire Protection and Prevention Plan shall include, but not be limited to, the following:

1. Requirement for the number and size of water trucks equipped with 50 feet of fast response hose with fog nozzles that shall be maintained on-site during construction for immediate response to fire incidents

2. Training of all construction workers on fire prevention methods, the proper use of firefighting equipment and procedures to be followed in the event of a fire.

3. Maintenance of fire extinguishers and fire-fighting equipment at each construction site sufficient to extinguish small fires.

4. Definition of appropriate defensible spaces that shall be maintained around permanent structures for acceptable wildland fire protection

There would be no adverse secondary impacts of Mitigation Measures PHS-1 and PHS-2.

Recreation

Mitigation Measure REC-1: ORNI 50, LLC shall post informational materials about the CD-IV Project at nearby recreation sites / campgrounds, access points, and the Mammoth Welcome Center. This material shall include construction schedules and safety information regarding trucks and other heavy equipment use on local roads and NFSRs, and identify route closures. In addition, construction vehicle speed shall be limited to 15 miles per hour; with temporary signage warning construction vehicles to reduce speeds in areas with blind corners, narrow roads, or hills.

Mitigation Measure REC-2: ORNI 50, LLC shall monitor all pipeline routes for evidence of OHV use and if such use is identified, further OHV use shall be prevented through posting of signs and the physical blocking of access, or other restriction measures. ORNI 50, LLC shall also monitor revegetation of pipeline alignments and replant vegetation if necessary.

Mitigation Measure REC-3: ORNI 50, LLC shall provide information regarding pipeline crossing locations and road closures at nearby recreation sites / campgrounds, access points, and the Mammoth Lakes Visitor Center. In addition, operational vehicle speed shall be limited to 15 miles per hour road and signage shall be installed, consistent with USFS and County requirements. ORNI 50, LLC shall also coordinate with the Town of Mammoth and the USFS to ensure that the OSV staging area and access to the staging area is plowed to provide winter access.

In addition, implement Mitigation Measures VIS-1 though VIS-3.

Socioeconomics and Environmental Justice

None required.

Traffic/Access/Circulation

Mitigation Measure TRA-1: Prior to construction and/or decommissioning, ORNI 50, LLC shall develop a Coordinated Transportation Management Plan and work with Mono County to prepare and implement a transportation management plan for roadways adjacent to and directly affected by the planned CD-IV Project facilities, and to address the transportation impact of the overlapping construction projects within the vicinity of the CD-IV Project in the region. The transportation management plan shall include, but not be limited to, the following requirements:

1. Coordination of individual traffic control plans for the Project and nearby projects.
2. Coordination between the contractor and Mono County in developing circulation and detour plans that include safety features (e.g., signage and flaggers). The circulation and detour plans shall address:
    a. Full and partial roadways closures
    b. Circulation and detour plans to include the use of signage and flagging to guide vehicles through and/or around the construction zone, as well as any temporary traffic control devices
    c. Bicycle/Pedestrian detour plans, where applicable
    d. Parking along public roadways
    e. Haul routes for construction trucks and staging areas for instances when multiple trucks arrive at the work sites
    f. Repairing and restoring affected roadway rights-of way to their original condition after construction and decommissioning are completed, where applicable.
3. Protocols for updating the transportation management plan to account for delays or changes in the schedules of individual projects.

Utilities and Public Services

None required.

Visual/Aesthetics

Mitigation Measure VIS-1: *Landscape Plan*. Prior to construction, ORNI 50, LLC shall prepare, submit for approval by the USFS, and implement a landscape plan that includes planting of native trees and shrub vegetation at select locations to further screen well site facilities and the geothermal pipeline from view from Sawmill Cutoff Road (NFSR 03S08), Sawmill Road (03S25), Shady Rest Park, U.S. Highway 395, SR 203, and Knolls Loop. To minimize adverse visual effects from the abovementioned roads and park, ORNI 50, LLC shall landscape the following areas at least one year prior to construction and surround landscaped sites during construction with dark colored protective fencing:

a. The northern side of well facility site 38-25 (near Shady Rest Park)

b. Along Sawmill Cutoff Road (NFSR 03S08) (between well facility sites 15-25 and 14-25, and at the pipeline crossing near well facility site 34-25)

c. Along Sawmill Road (03S25) (between well facility sites 81-36, 12A-31, 23-31, 35-31, and 55-31)

d. At pipeline crossover near Knolls Loop (approximately 700 feet southeast of well facility site 34-25)

e. At pipeline crossovers adjacent to Sawmill Road (03S25) and Pole Line Road (03S123) (near well facility sites 56-25,66-25, 77-25, 81-36, 12A-31, 23-31, 35-31, and 55-31)

Mitigation Measure VIS-2: *Underground Pipeline Crossovers*. At locations where one pipeline crosses over another, ORNI 50, LLC shall reduce the height of crossovers by implementing either of the following methods:

a. Install either the existing pipeline or new pipeline underground. To prevent snowmelt, the underground pipeline shall be insulated and a 2- to 4- inch air gap shall be maintained between the insulation and the casing pipe. The top of the casing pipe would be at least 3 to 6 feet below grade.

b. Lower the existing pipeline or new pipeline (whichever is easiest) belowground or within a 3-foot deep trench and design the pipeline crossover with an angled bend to ensure that the overall height of the crossover is at or below 4 feet aboveground.

c. All expansion loops shall be non-vertical to minimize overall height of installed pipelines to less than 4 feet aboveground.

Mitigation Measure VIS-3: *Power Plant Landscape Plan*. Prior to construction, ORNI 50, LLC shall prepare, submit for approval by the USFS, and implement a landscape plan that includes planting of native trees, shrubs, and perennial vegetation to screen views from Antelope Springs Road. ORNI50, LLC shall landscape the area immediately adjacent to Antelope Springs Road at least one year prior to construction to reduce adverse visual effects of the facility.

Water Resources

Mitigation Measure SW-1: Comprehensive Site Drainage and Runoff Management Plan (Drainage Plan). According to PDM HYD-5, the Applicant would prepare a Drainage Plan. Additionally, the Applicant shall ensure that the prepared plan adheres to the following:

> The Applicant shall prepare and submit to the LRWQCB, BLM and USFS for review the Drainage Plan that shall encompasses all proposed facilities. The Drainage Plan shall evaluate potential changes in stormwater flow that would result from implementation of the Proposed Action, to the extent required to determine implementation of appropriate measures to minimize, avoid, retain, or otherwise prevent increases in stormwater runoff from leaving the site, and minimize potential for associated erosion or sedimentation. The Drainage Plan shall also delineate location and sizing for proposed stormwater retention facilities, on-site drainages, and other required facilities as warranted to ensure that proposed stormwater facilities are sized appropriately. All stormwater and drainage facilities shall be sized to ensure that the implementation of the Proposed Action would result in no net increase in stormwater discharge from the site during at least a 20-year, 24-hour storm event. With respect to decommissioning, a drainage plan will be included in the reclamation plan, which will be submitted to relevant agencies for approval prior to the initiation of the decommissioning process. This will ensure that final post-decommissioning grading reflects natural site contours and minimizes potential for concentration of stormwater flows, erosion, and sedimentation. All proposed facilities shall comply with the all aspects of the Drainage Plan as indicated here and in PDM HYD-5, including existing and new/proposed access roads and roads that would be plowed during the winter due to proposed operations.

Mitigation Measure SW-2: To ensure that sediment and other pollutants contained in the proposed well construction period containment basins/sumps would not be released into downstream waters, the Applicant shall ensure that all containment basins/sumps are constructed so as to be able to contain anticipated drill cuttings, drilling mud, other drilling liquids, and on-site flows anticipated from a 100-year event with sufficient freeboard to prevent overtopping. Upon completion of drilling activities and disposal of drill cuttings, all containment basins/sumps shall be backfilled and graded to match natural topography.

Mitigation Measure SW-3: Following well completion, in the event that coverage under the Statewide General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality cannot be acquired in support of disposal of drill cuttings, the Applicant shall remove all drill cuttings from each well site where on-site disposal is not available. Removed drill cuttings shall be disposed of in a landfill or other facility approved to accept hazardous wastes (or in accordance with classification of drill cutting waste from the site), in accordance with local and state law. Remaining pits on-site shall be filled and graded to match natural conditions.

Mitigation Measure SW-4: During well testing, the Applicant shall ensure that all storage tanks and piping for geothermal fluid storage and conveyance at the well pad site would be contained within a temporary facility that would contain spilled fluid on-site. Containment structures may include berms, containment basins, sumps, or other structures with sufficient capacity to contain the maximum volume of geothermal fluid stored on-site, with sufficient freeboard to prevent accidental release.

Mitigation Measure SW-5: Prior to the initiation of operations, the Applicant shall ensure that the proposed spill containment facilities at the power plant site incorporate measures to prevent the infiltration to groundwater of spilled fluids at the plant site, including geothermal fluid and n-pentane. In accordance with the Mono County General Plan, the capacity of the proposed containment facilities shall be equal to at least twice the volume of the entire fluid contents of the power plant facility, including pipeline capacity and the amount that would flow onto the site until automatic shutdown devices would stop the flow. Spill containment facility design shall be reviewed by the USFS and BLM prior to the initiation of construction activities for the power plant.

Mitigation Measure SW-6: During Project operation, the applicant shall ensure that equipment and vehicles are routinely inspected for fluid leaks. Equipment and vehicles shall be maintained so as to prevent equipment leaks from infiltrating into soils or being washed off-site during storm events. When discovered, the applicant will repair fluid leaks prior to use on the project site. If fluids do leak onto the project site, contaminated soil will be removed immediately and disposed of at an approved facility, in accordance with federal, state, and local requirements.

2.3 Alternative 2 – Plant Site Alternative

Alternative 2 would site the CD-IV power plant and related facilities to the east of the existing Casa Diablo Geothermal Complex power plant facilities.

2.3.1 Power Plant

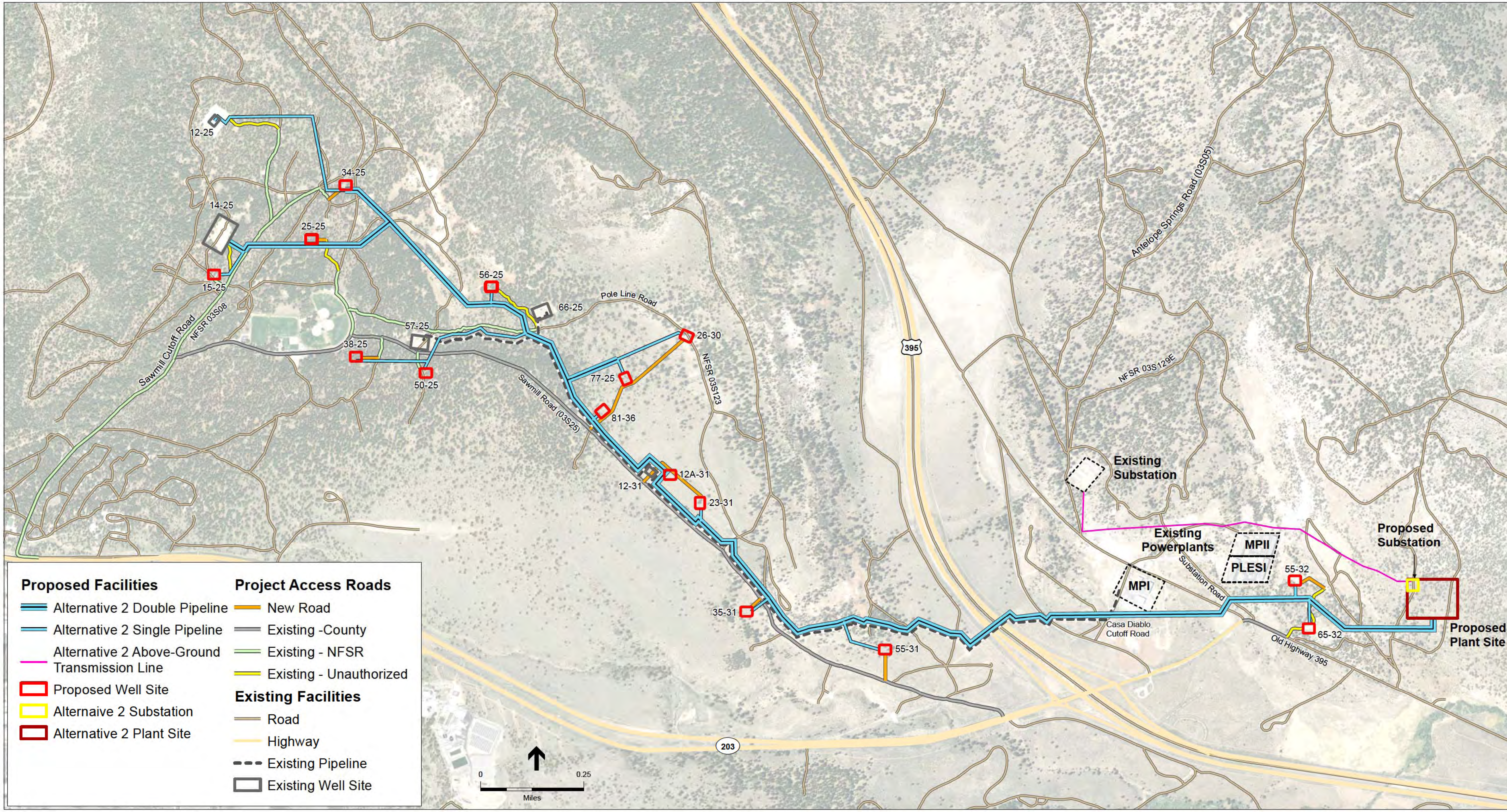
2.3.1.1 Location

Under Alternative 2, the Alternative Plant Site and substation would be located to the east of the existing Casa Diablo power plant facilities, specifically east of proposed injection Wells 55-32 and 65-32 as shown on Figure 2-13.

2.3.1.2 Components

The power plant site would require the clearing and grading of approximately 317,988 square feet (7.3 acres) using similar methods described for Alternative 1 (Proposed Action). Once grading has been completed, phased construction of the power plant would use the same equipment and methodology described for the Proposed Action, and all power plant components to be installed would be the same.

Similar to the Proposed Action, a new electrical substation would be located adjacent to the alternative power plant site. An above-ground electrical transmission line would connect to the SCE substation. The 33kV electrical connection line would be approximately 4,888feet (1,490 meters) long, and supported by 12 to 15 poles. Similar to the Proposed Action, prior to construction the transmission line alignment would be cleared of trees for an area approximately 50 feet wide enough to permit passage of construction equipment and in accordance with clearance requirements. Power plant operation and decommissioning would be the same as the Proposed Action.



SOURCE: Ormat, 2010; NAIP, 2010, USFS, 2011

Casa Diablo IV Geothermal Development Project . 209487

Figure 2-13
Alternative 2 Layout

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2.3.2 Wellfield

Alternative 2 would develop the same wellfield using the same well locations (up to 16 wells out of 18 possible locations) as described under the Proposed Action, and construction, development and operation of the wells would be the same.

2.3.3 Pipelines

Under Alternative 2, the total production and injection pipeline alignment is estimated to be slightly more extensive than under the Proposed Action. The Alternative 2 alignment would total approximately 5.4 miles (8.7 km), of which up to 3.9 miles (6.3 km) could consist of double pipeline (two pipelines aligned parallel to each other). The total length of pipeline would be approximately 9.3 miles (15.0 km), which is 0.2 mile longer than the Proposed Action pipeline.

2.3.3.1 Geothermal Production Pipeline

The geothermal fluid produced from the production wells would be conveyed to the alternative power plant site in a pipeline from the wellfield to U.S. Highway 395, and would cross under U.S. Highway 395, as described for the Proposed Action. East of U.S. Highway 395, the pipeline would proceed east to the Alternative Plant Site, rather than north to the plant site under the Proposed Action. This production pipeline would parallel an injection pipeline (Figure 2-13).

2.3.3.2 Injection Pipelines

The injection pipelines would transport spent geothermal brine to be reinjected into the geothermal aquifer. Reinjection in Wells 55-32 and 65-32, located east of U.S. Highway 395, would require a relatively short injection pipeline of approximately 1,900 feet from the Alternative Plant Site to these wells, as shown in Figure 2-13. If future production and modeling results indicate that spent brine should be reinjected in Basalt Canyon wells, Alternative 2 would include construction and operation of a third pipeline parallel to the existing pipeline and the proposed geothermal fluid production pipeline to convey spent brine from the Alternative Plant Site to the proposed injection well locations. West of U.S. Highway 395, the injection pipeline route would be the same as for the Proposed Action; east of U.S. Highway 395, the injection pipeline would follow the same route as the injection pipeline for the Proposed Action with additional pipeline constructed between the wells 55-32 and 65-32 and the Alternative Plant Site.

2.3.3.3 Pipeline Crossovers

At locations where a new pipeline must cross a road, the existing pipeline, and/or a new project pipeline, the pipeline crossings would be underground. Construction would involve using the same trench excavation cut-and-fill method described for road undercrossings in Section 2.2.5.4.

2.3.3.4 Access Roads

Improvement of existing roads and construction of new access roads to provide access to the geothermal wells would be the same as under the Proposed Action. The power plant site would require the improvement of existing NFSRs to provide access as shown in Figure 2-13. Alternative 2 would require rerouting of NFSR 03S130 around the power plant. A total of approximately 0.77 miles (1.24 km) of new access roads and improvement of 5.84 miles (9.40 km) of existing roads would be required under this alternative. Alternative 2 would not require the closure of any portion of NFSR 03S129E in the vicinity of the power plant site, but would require closure of a portion of NFST 28E207. Improvements to existing roads would include the same methods as under the Proposed Action, such as the installation of road base to allow for winter plowing.

2.4 Alternative 3 – Modified Pipeline Alternative

Under Alternative 3, the Modified Pipeline Alternative, the geothermal production and injection pipeline alignment would be modified as shown on Figure 2-14. The purpose of the alignment changes under this alternative is to reduce potential effects on cultural resources, recreation and wildlife (deer) in the Basalt Canyon area and minimize potential visual effects east of U.S. Highway 395.

2.4.1 Power Plant

Under Alternative 3, the power plant location, components, construction, operation, and decommissioning would be the same as the Proposed Action.

2.4.2 Wellfield

Alternative 3 would develop the same wellfield using the same well locations (up to 16 wells of 18 possible well locations.) as described under the Proposed Action, with the exception of Well 26-30 which would be moved slightly northwest (Figure 2-14). Construction, development, and operation of the wells would be the same.

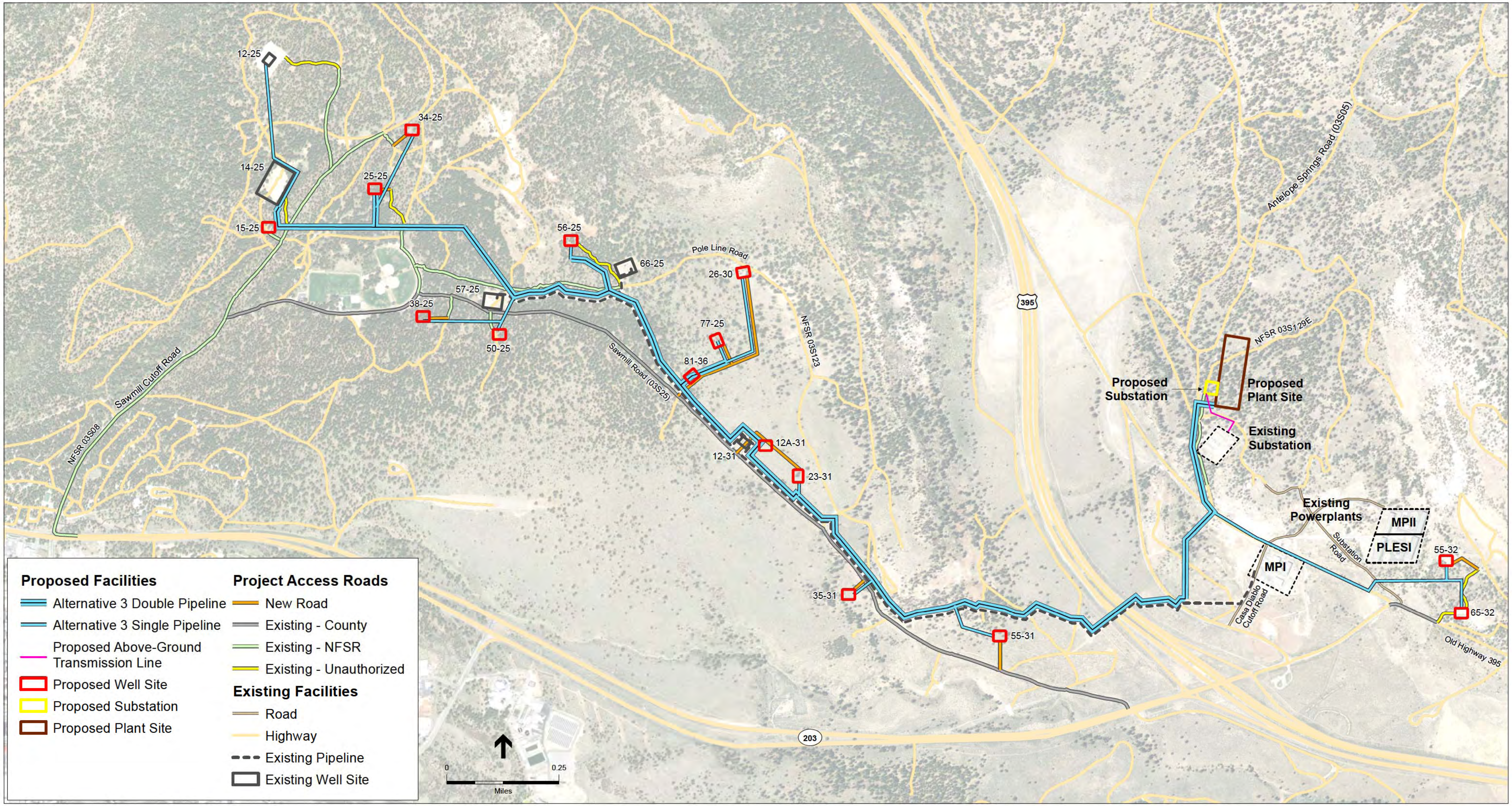
2.4.3 Pipelines

Under Alternative 3, the total production and injection pipeline alignment is estimated to be slightly less extensive than under the Proposed Action. The Alternative 3 alignment would total approximately 5.4 miles (8.7 km), of which up to 3.7 miles (6.0 km) could consist of double pipeline (two pipelines aligned parallel to each other). The total length of pipeline would be approximately 9.1 miles (14.6 km) (Figure 2-14).

2.4.3.1 Geothermal Production Pipeline

The geothermal fluid produced from the production wells would be conveyed to the CD-IV power plant in a pipeline that would follow a similar route as the Proposed Action, with the following differences:

1. In Upper Basalt Canyon, the production pipeline from Well 12-25 would proceed south toward Well 14-25 and 15-25, rather than east and south to Well 34-25.



SOURCE: Ormat, 2010; NAIP, 2010; USFS, 2011

Casa Diablo IV Geothermal Development Project . **209487**

Figure 2-14
Alternative 3 Layout

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2. The production pipeline from Well 26-30 and Well 77-25 would be moved to the south, connecting near Well 81-36.

3. The production and injection pipeline corridor would be narrowed to the east of Sawmill Road and Well 35-31.

2.4.3.2 Injection Pipeline

The injection pipelines would transport spent geothermal brine to be reinjected into the geothermal aquifer. The injection pipeline would be the same as the Proposed Action. It would follow the same route to Wells 55-32 and 65-32. If future production and modeling results indicate that spent brine should be reinjected in Basalt Canyon wells, Alternative 2 would include construction and operation of a third pipeline parallel to the existing pipeline and the proposed geothermal fluid production pipeline to convey spent brine from the CD-IV power plant to the proposed injection well locations.

2.4.3.3 Pipeline Crossovers

At locations where a new pipeline must cross the existing pipeline, a production or injection pipeline, or both, the pipeline crossings would be underground. The construction of undercrossings would be by trench excavation cut-and-fill method, as described in Section 2.2.5.4 for the road undercrossings

2.4.3.4 Access Roads

Improvement of existing roads and construction of new access roads to provide access to the Power Plant and the geothermal wells would be the same as under Alternative 1. A total of approximately 0.87 miles (1.4 km) of new access roads and improvement of 5.58 miles (8.98 km) of existing roads would be required under this alternative. Improvements to existing roads would include the same methods as under the Proposed Action, such as the installation of road base to allow for winter plowing. In addition, under Alternative 3, Sawmill Cutoff Road (NFSR 03S08) would be widened to include a shoulder between SR 203 and the intersection with NFSR 03S08N near proposed well 34-25. The section of road between SR 203 and Shady Rest Park is currently paved but would be widened to include a shoulder beyond the fog line. Road construction beyond Shady Rest Park would also include a shoulder as well as the installation of drainage features to maintain hydrology. The width of the road would be the same from SR 203 to Well 34-25, north of the intersection of Sawmill Road (03S25).

2.5 Alternative 4 – No Action Alternative

As required under NEPA and CEQA, Alternative 4 is the No Action Alternative, under which the proposed CD-IV geothermal development project, including the proposed geothermal power plant, geothermal wells, and pipelines, would not be constructed. The three existing geothermal power plants (MP-I, MP-II and PLES-I), the pipeline from Basalt Canyon, and two existing production wells would continue operating in accordance with their respective permits.

Under the No Action Alternative, geothermal exploration in Basalt Canyon and Upper Basalt Canyon previously approved would be expected to continue. Previous analyses resulted in the approval of up to ten small diameter (slim hole) and six geothermal exploratory (large diameter) geothermal wells (Figure 2-15). As shown in Table 2-2, one of the ten small diameter wells (12-31) has already been drilled. In addition, four of the large diameter wells have been completely drilled (Table 2-2). Under the No Action Alternative, while no activities related to the Proposed Action would occur, as result of prior approvals nine additional small diameter and two large diameter exploratory wells could be drilled. However, not all of the well locations shown on Figure 2-2 were included in those previous authorizations: Wells 50-25, 26-30, 12A-31, 55-32, and 65-32 do not have approval and would not be drilled under the No Action Alternative.

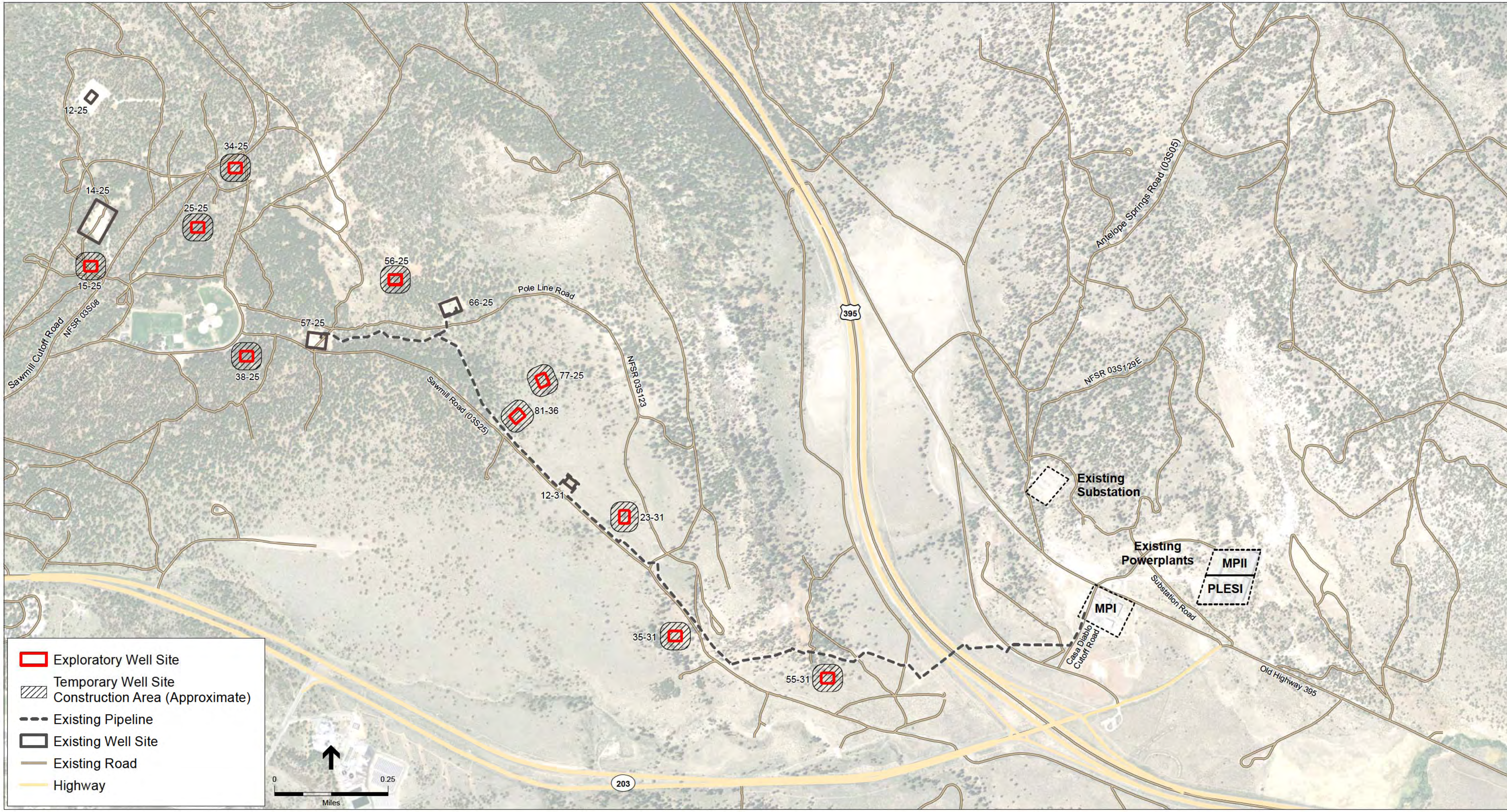
2.6 Comparison of Impacts by Alternative

Table 2-4 presents a comparison of the differences in impacts among the alternatives described in Sections 2.2 through 2.5 above. The information in Table 2-4 is derived from the analysis of environmental consequences presented in Chapter 4.

2.7 Federal Lead Agency Preferred Alternative and CEQA Environmentally Superior Alternative

Under NEPA, the "preferred alternative" is a preliminary indication of the lead agency's preference of action among the Proposed Action and alternatives. A NEPA lead agency may select a preferred alternative for a variety of reasons, including the agency's priorities, in addition to the environmental considerations discussed in the EIS. In accordance with NEPA (40 CFR 1502.14(e)), the BLM and USFS have identified Alternative 3 as the Preferred Alternative.

Under CEQA, an "environmentally superior alternative" must be identified from among the alternatives analyzed in an EIR or EIS/EIR. The environmentally superior alternative is the alternative found to have an overall environmental advantage compared to the other alternatives based on the impact analysis in the EIR. If the environmentally superior alternative is the No Action Alternative, then the EIR must identify an environmentally superior alternative from among the other alternatives (14 CCR §15126.6(e)(2)). For this Project, the No Action Alternative would be environmentally superior to any of the alternatives, because the impacts of implementing the Proposed Action would be avoided. Among the other alternatives, Alternative 3 has been identified by GBUAPCD as the environmentally superior alternative because of the reduced environmental impacts presented in Table 2-4. Reduced environmental impacts are associated with visual, geological, and cultural resources. Alternative 3 would result in reduced impacts on cultural resources and visual resources relative to the Proposed Action.



SOURCE: Ormat, 2010; NAIP, 2010

Casa Diablo IV Geothermal Development Project . **209487**

Figure 2-15
No Action Alternative

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TABLE 2-4
COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Resource	Alternative 1 Proposed Action	Alternative 2 Alternative Plant Site	Alternative 3 Modified Pipeline Alternative	Alternative 4 No Action
Air Resources	Short-term unavoidable construction and long-term operation impacts related to contributing to exceedances of the state 1-hour and/or 8-hour ozone Ambient Air Quality Standards, and impacts to sensitive receptors.	Same impacts as the Proposed Action related to unavoidable contributions to exceedances of the state 1-hour and/or 8-hour ozone Ambient Air Quality Standards; negligible impacts to sensitive receptors slightly increased relative to the Proposed Action.	Similar impacts as the Proposed Action related to unavoidable contributions to exceedances of the state 1-hour and/or 8-hour ozone Ambient Air Quality Standards; negligible impacts to sensitive receptors slightly increased relative to the Proposed Action as the modified route north of Shady Rest Park would be approximately 350 feet closer to the park than would the route under the Proposed Action.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Biological Resources – Vegetation	Potential for impacts to native vegetation communities (Jeffrey Pine Forest and Big Sagebrush Scrub), special-status and sensitive plant species and spread of noxious weeds, including.61.1 acres of temporary vegetation removal and 15.3 acres of permanent vegetation removal	Similar impacts as the Proposed Action. Impacts to specific vegetation communities would vary slightly as less Jeffrey pine forest would be impacted but impacts to big sagebrush scrub would increase. Vegetation removal would include 20.96 acres of permanent removal and 60.5 acres of temporary removal.	Similar impacts as the Proposed Action. Under Alternative 3 there would be 15.3 acres of permanent vegetation removal and 59.9 acres of temporary vegetation removal.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Biological Resources – Wildlife	Potential impacts on wildlife habitats and special status species (such as Northern goshawk, sage-grouse, Sierra marten, and migratory birds) as well as mule deer migration.	Similar impacts on wildlife habitats and special status species. Similar impacts on mule deer migration routes, although shifted east away from Highway 395 resulting in slightly reduced mortality due to vehicle collisions. A 0.4-mile increase in length of double pipelines could result in a slightly increased impedance to deer movement.	Similar impacts as the Proposed Action on wildlife habitats, special status species, and mule deer migration.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Climate Change	GHG emissions generated by the project are offset by the renewable energy generated. The Project would be expected to displace over 89,000 metric tons of CO_2e per year, for the 30 year life of the Project	Same as the Proposed Action	Similar impacts as the Proposed Action.	No GHG emissions associated with the construction, operation, and decommissioning of CD-IV would occur; however, the displacement of GHG emissions from existing fossil fuel-fired power plants would not occur as well.
Cultural and Paleontological Resources	Potential for impacts on historical, archaeological and paleontological resources and on human remains.	Same as the Proposed Action	Similar impacts as the Proposed Action, but would affect fewer known cultural resources.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).

TABLE 2-4 (Continued)
COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Resource	Alternative 1 Proposed Action	Alternative 2 Alternative Plant Site	Alternative 3 Modified Pipeline Alternative	Alternative 4 No Action
Geothermal and Groundwater Resources	Potential impacts on geothermal hydrologic features and groundwater resources are anticipated to be minimal.	Same as Proposed Action	Same as Proposed Action	No impact.
Geologic, Soil and Mineral Resources	Potential impacts on soil resources and impacts related to soil and ground instability.	Same as the Proposed Action	Same as the Proposed Action but slightly reduced.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Grazing, Wild Horses and Burros	Under the Proposed Action, there would be 15.3 acres of permanent vegetation removal and 61.1 acres of temporary vegetation removal.	Alternative 2 would result 20.96 acres of permanent vegetation removal and 60.5 acres of temporary vegetation removal.	Under Alternative 3 there would be 15.3 acres of permanent vegetation removal and 59.9 acres of temporary vegetation removal.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Land Use	The potential to temporarily divide a community and conflict with local land use plans, policies and regulations would be less than significant.	Same as the Proposed Action	Same as the Proposed Action	No impact.
Noise and Vibration	Noise impacts to sensitive receptors from project construction, operation and maintenance, and decommissioning.	Short-term impacts to sensitive receptors slightly increased relative to the Proposed Action; long-term increased noise levels at the closest receptor would conflict with local noise ordinance resulting in an unavoidable increased impact relative to the Proposed Action.	Same as Proposed Action.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Population and Housing	Potential to increase the local population. The average construction workforce would range from 10 to 20 workers during low activity periods and 100 to 120 during high activity periods. Only about six new employees would be required for operation of the CD-IV Project	Same as the Proposed Action	Same as the Proposed Action	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).

TABLE 2-4 (Continued)
COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Resource	Alternative 1 Proposed Action	Alternative 2 Alternative Plant Site	Alternative 3 Modified Pipeline Alternative	Alternative 4 No Action
Public Health and Safety, Hazardous Materials and Fire	Potential for accidental release of hazardous materials. Potential increased risk of fire and need for emergency response.	Same as the Proposed Action	Same as the Proposed Action.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Recreation	Potential for impacts to regional and local roads and trails used for walking, jogging, bicycling, and OHV uses during construction and operation and maintenance.	Same as the Proposed Action.	Same as the Proposed Action.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Socioeconomics and Environmental Justice	No impact.	No impact.	No impact.	No impact.
Traffic and Transportation	Potential increase in traffic along regional and local roadways during construction, operation, and decommissioning activities. Also, the creation of potential road hazards during construction and decommissioning.	Same as the Proposed Action.	Same as the Proposed Action.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).
Utilities and Public Services	Potential impacts during construction of stormwater drainage facilities and temporarily increase demand for potable water and water for construction and decommissioning activities.	Same as the Proposed Action.	Same as the Proposed Action.	No Impact
Visual Resources	Potential impacts on visual resources would result from tree removal, construction and decommissioning activities and equipment, and lighting for construction and operations. Long-term impacts on the visual character and quality of the Project site would occur due operation of the pipelines and well facilities. Even with implementation of PDMs and Mitigation Measures VIS-1, VIS-2, and VIS-3, such impacts would be unmitigable.	Similar to the Proposed Action. The power plant would be more visually evident in comparison to Alternative 1. Because the new pipelines, well facilities, and power plant would be visible and since the visual sensitivity of the Project Area is high, impacts would be unmitigable.	Reduced relative to the Proposed Action because pipeline crossings would be underground. However, because the new pipelines and well facilities would be visible and since the visual sensitivity of the Project Area is high, impacts would be unmitigable.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).

TABLE 2-4 (Continued)
COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Resource	Alternative 1 Proposed Action	Alternative 2 Alternative Plant Site	Alternative 3 Modified Pipeline Alternative	Alternative 4 No Action
Surface Water Resources	Potential for degradation of water quality from accidental releases and alteration of drainage patterns	Same as the Proposed Action	Same as the Proposed Action.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur. Note: Previously approved drilling activities not associated with the CD-IV project may occur at some well locations (Table 2-2).

2.8 Alternatives Considered but Eliminated from Detailed Analysis

2.8.1 Underground Pipeline Alternative

To reduce the potentially significant visual impacts of installation of two additional pipelines (production and injection) parallel to the existing Basalt Canyon geothermal pipeline, burying the two pipelines was considered as an alternative. An underground pipeline could also reduce the potential impact on wildlife movement and recreational trail users, particularly cross country skiers and snowmobiles, from above-ground pipelines. This potential alternative was eliminated from detailed consideration because it was not technically practical and would cause additional impacts on environmental resources.

Pipelines expand and lengthen as they are heated by geothermal fluid, and they contract and shorten as they cool when no geothermal fluid is flowing. Since geothermal fluid pipelines could rupture from the stress caused by this expansion and contraction, these pipelines cannot be buried directly in the earth. Further, geothermal pipelines must be accessible so they can be drained of fluid, visually inspected for leaks, maintained and repaired, as necessary. In order for geothermal pipelines to be constructed below ground, they would need to be installed within a larger containment pipe or enclosed concrete culvert that provides for expansion and contraction, as well as access for inspection and maintenance. In order to contain two 16-inch pipelines and provide sufficient access, the casing pipe or culvert diameter would likely be at least 4 to 5 feet.

The most common method of underground pipeline installation is by open-cut trench excavation, which would require excavating a trench at least 8 feet wide by 6 feet to accommodate a 4- to 5-foot diameter casing pipe. In some locations of the Basalt Canyon area, it is possible that blasting or other hard rock excavation technique would be required to trench through bedrock. The environmental impacts from the construction of these large underground pipelines would far exceed that of above-ground construction, causing additional potentially significant environmental impacts related to vegetation clearance, cultural resources, burrowing animals, soil erosion, water quality, noise, and traffic from haul trucks removing excavated material.

2.8.2 Reduced Power Alternative

A reduced power alternative was considered as a means of potentially reducing the surface disturbance effects of Project facilities and to explore the potential differences in effects on the geothermal and hydrologic resources. It was assumed that reducing the generating capacity of the power plant would lessen the number of wells necessary for production, which would reduce the area of surface disturbance for well pads. This would in turn reduce the overall footprint of the project and impacts related to vegetation removal and well construction. For geothermal power production, the location of production wells is restricted by the location of the geothermal resource, as has been identified through the leasing and exploratory drilling processes approved previously. A reduced power alternative would still require the construction of production wells (although likely fewer) in the Basalt Canyon and Upper Basalt Canyon areas. The location of injection wells would be partially determined through operation and monitoring and it is assumed a reduced power alternative would require injection in the Basalt Canyon area similar to Alternatives 1 through 3. The total number of production and injection wells required would be determined by the size of the power plant and the geothermal resource. It is not possible pre-development to estimate the exact number of wells that would be required under a reduced power alternative.

If the number of wells required for a reduced power alternative is fewer, the length of corresponding pipelines could be reduced. However, it is likely, based on the extent of exploratory drilling previously conducted that the pipeline would extend into Basalt Canyon to wells 12-25 and 14-25 under a reduced project alternative. As a result, a reduced power alternative would require a similar number and alignment of pipelines between the power plant and wells. A reduced power alternative could result in a smaller power plant footprint, thereby reducing the amount of grading and disturbance at the power plant site. The footprint of a reduced power plant is not known at this time and would be dependent upon final design and amount of power output.

Additionally, the CD-IV Project would result in impacts on air quality. Impacts on air quality would result from short-term construction and operational emissions. Under the proposed power scenario (Alternatives 1 through 3) short term NOx emissions exceed the applicable threshold for maximum day emissions by 300 percent and operational emissions exceed the applicable threshold by over 500 percent. Given the magnitude of the exceedances, the reduced power alternative would reduce air quality impacts but not to a level below applicable thresholds. The CD-IV Project could displace electricity from the existing regional electrical grid which includes electricity generated from fossil fuel-fired power plants equivalent to an estimated 89,000 metric tons of CO_2e annually, resulting in a net reduction of more than 88,000 metric tons CO_2e per year. Under a reduced power alternative, this beneficial impact would be reduced.

The CD-IV Project would result in impacts on visual resources related to construction, operation and maintenance of wells and pipelines in areas designated by the USFS with a VQO of “retention” and/or where facilities are within the BLM Restricted Surface Occupancy zone after mitigation has been incorporated. A reduced power alternative would not avoid this impact as pipelines and wells would still be constructed in this area at a relatively similar level.

The reduced power alternative was also examined as a means of addressing potential impacts on the geothermal resource and surface and groundwater resources. It was assumed that a reduced power alternative would require less geothermal resource production fluid and reinjection. The geothermal modeling and analysis for Alternatives 1 through 3 determined that the potential effects on geothermal and groundwater resources would be minimal. Therefore a reduced power alternative was not warranted as there were no issues to be addressed related to geothermal resource use or surface and groundwater resources.

In summary, a reduced power alternative would not substantially address issues related to surface disturbance, air quality or visual resources compared to the design and mitigation measures incorporated into Alternatives 1 through 3. A reduced power alternative would also reduce the beneficial impacts resulting from the net reduction of CO_2e per year. Additionally, the proposed power production level results in minimal effects on geothermal and groundwater resources and does not warrant additional reduction through a reduced power alternative. Therefore, this alternative was not carried forward for further analysis and consideration. As result of these considerations, the Lead Agencies determined that a reduced power alternative would not respond to their respective Purpose and Need for the Proposed Action or meet CD-IV Project objectives.

2.8.3 Alternative Plant Site in Basalt Canyon

An alternative power plant site in Basalt Canyon was considered conceptually to minimize the length of the geothermal fluid and injection pipelines. This alternative would somewhat reduce the impact of the pipelines on visual resources, wildlife movement, and recreation; and, it would not result in impacts associated with trenching and excavation described for the Underground Pipeline Alternative. Construction of a power plant in Basalt Canyon, however, results in a tradeoff of environmental impacts. The electrical transmission line to the SCE substation would be substantially longer than the Proposed Action. Construction and operation of a power plant in Basalt Canyon would require additional site clearing and construction of road improvements, and possibly new roads, with substantial traffic increases in this forested area. Impacts on recreation, noise, wildlife, cultural resources, and visual resources would likely be more severe as well. Further, this location could have increased surface occupancy conflicts and is closer to the Town of Mammoth Lakes. As a result of these additional potential impacts, the Basalt Canyon location was determined to result in greater impacts than the Proposed Action and was not carried forward for review.

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CHAPTER 3
Affected Environment

3.1 Introduction and Overview

Chapter 3 describes the resources, resource uses, environmental components, and other important topics (i.e., public health and safety, social and economic considerations, and environmental justice conditions) relevant to the action area that could be affected by implementation of the CD-IV Project.

Information and data used to prepare this chapter were obtained from several sources, including BLM and USFS planning and NEPA documents. Additionally, information was also collected from many other related planning documents and research publications prepared by various federal and state agencies as well as from private sources, including ORNI 50, LLC, pertaining to key resource conditions and resource uses found within the project area. The purpose of this chapter is to provide a description of affected resources, and both BLM and USFS-managed areas within the existing environment of the project area, which will be used as a baseline to evaluate and assess the impact of the alternatives described in Chapter 2. Descriptions and analyses of the impacts themselves are presented in Chapter 4, Environmental Consequences.

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3.2 Air Resources

This section describes the meteorological conditions, existing air quality, sensitive receptors, and regulations, plans, and policies, including federal, state, and local laws, related to air resources that may be relevant to the Proposed Action and Alternatives.

3.2.1 Environmental Setting

3.2.1.1 Meteorological Conditions

The project area is within the Great Basin Valleys Air Basin (GBVAB), east of the community of Mammoth Lakes at an elevation of approximately 7,300 feet above sea level. The climate of area is characterized by harsh winters and temperate summers. Winter storms carry moisture over the Sierra crest alternating with periods of dry clear weather. The regional weather pattern in summer provides prolonged periods of fair weather with occasional thunderstorms (Mono County, 2001). The study area typically has average maximum and minimum winter (i.e., January) temperatures of 41 degrees Fahrenheit (°F) and 16 °F, respectively, while average summer (i.e., July) maximum and minimum temperatures are 78 °F and 46 °F, respectively. Total precipitation in Mammoth Lakes averages approximately 23 inches per year and total snowfall averages approximately 210 inches per year, with precipitation events being concentrated from December through April (WRCC, 2012).

3.2.1.2 Existing Air Quality

The Federal Clean Air Act and the California Clean Air Act both require the establishment of standards for ambient concentrations of air pollutants, called Ambient Air Quality Standards (AAQS). The federal AAQS, established by U.S. Environmental Protection Agency (USEPA), are typically higher (less protective) than the state AAQS, which are established by the CARB. The federal and state air quality standards are listed in Table 3.2-1. The air quality standard time periods over which the various pollutants are measured range from a 1-hour average to an annual average. The standards are read as a concentration, in parts per million (ppm) or as a weighted mass of material per a volume of air, in milligrams or micrograms of the pollutant in a cubic meter of air (mg/m^3 or $\mu g/m^3$, respectively).

In general, an area is designated as attainment if the concentration of a particular air contaminant does not exceed the standard. Likewise, an area is designated as non-attainment for an air contaminant if that contaminant standard is violated. In circumstances where there is not enough ambient data available to support designation as either attainment or non-attainment, the area can be designated as unclassified. An unclassified area is normally treated by the USEPA the same as an attainment area for regulatory purposes. An area could be attainment for one air contaminant while non-attainment for another, or attainment for the federal standard and non-attainment for the state standard for the same air contaminant.

TABLE 3.2-1
FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standard	California Standard
Ozone (O_3)	8-Hour	0.075 ppm (147 μg/m^3)	0.070 ppm (137 μg/m^3)
	1-Hour	—	0.09 ppm (180 μg/m^3)
Carbon Monoxide (CO)	8-Hour	9 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1-Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 μg/m^3)	0.030 ppm (57 μg/m^3)
	1-Hour	0.100 ppm[a] (188 μg/m^3)	0.18 ppm (339 μg/m^3)
Sulfur Dioxide (SO_2)	Annual	—	—
	24-Hour	—	0.04 ppm (105 μg/m^3)
	3-Hour	0.5 ppm (1,300 μg/m^3)	—
	1-Hour	0.075 ppm[b] (196 μg/m^3)	0.25 ppm (655 μg/m^3)
Particulate Matter (PM10)	Annual	—	20 μg/m^3
	24-Hour	150 μg/m^3	50 μg/m^3
Fine Particulate Matter (PM2.5)	Annual	15 μg/m^3	12 μg/m^3
	24-Hour	35 μg/m^3	—
Sulfates (SO_4)	24-Hour	—	25 μg/m^3
Lead (Pb)	30-Day Average	—	1.5 μg/m^3
	Calendar Quarter	1.5 μg/m^3	—
	Rolling 3-Month Average	0.15 μg/m^3 [c]	—
Hydrogen Sulfide (H_2S)	1-Hour	—	0.03 ppm (42 μg/m^3)
Vinyl Chloride (chloroethene)	24-Hour	—	0.01 ppm (26 μg/m^3)
Visibility Reducing Particulates	8-Hour	—	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70%.

NOTES:

a The USEPA is in the process of implementing this new standard, which became effective April 12, 2010. This standard is based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations.

b On June 2, 2010, the USEPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The USEPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010.

c National lead standard, rolling 3-month average: final rule signed October 15, 2008.

SOURCE: CARB, 2012a.

The GBVAB is comprised of a single air district, the GBUAPCD, and consists of Alpine, Mono, and Inyo Counties. The entire air basin currently exceeds the state 24-hour PM10 standard and the project area exceeds the state 1- and 8-hour ozone standards. The air basin is designated as attainment for the state standards for PM2.5, H_2S, CO, NO_2, SO_2, sulfates, lead, and is unclassified for visibility reducing particles (CARB, 2011a). The GBVAB is in attainment for all federal standards, with the exception of an isolated region around the Mammoth Lakes area that is non-attainment for PM10, largely as a result of smoke from wood fires. The federal PM10 non-attainment area surrounds the Town of Mammoth Lakes and includes all of the Project area

(USEPA, 2011a). Table 3.2-2 summarizes the CD-IV Project area's attainment status for various applicable state and federal standards.

TABLE 3.2-2
FEDERAL AND STATE ATTAINMENT STATUS FOR THE CD-IV PROJECT AREA

Pollutant	Exposure Period	Attainment Status	
		Federal	State
Ozone	1-hour	—	Non-attainment
	8-hour	Attainment	Non-attainment
CO	1-hour and 8-hour	Attainment	Attainment
NO_2	Annual and 1-hour	Attainment	Attainment
SO_2	1-hour	Unclassified	Attainment
	3-hour	Unclassified	—
	24-hour	—	Unclassified
PM10	Annual	—	Unclassified*
	24-hour	Non-Attainment	Moderate Non-attainment
PM2.5	Annual	Attainment	Attainment
	24-hour	Attainment	—

NOTE: Unclassified is treated the same as Attainment for regulatory purposes.

SOURCES: CARB, 2011a and 2012b; and USEPA, 2011a.

Ambient air quality is monitored in the CD-IV Project area at the Mammoth Lakes monitoring station. PM10 is the only pollutant monitored at the Mammoth Lakes monitoring station and none of the other monitoring stations in Mono County monitor for pollutants other than PM10. The closest monitoring station to the CD-IV Project site in the GBVAB that monitors ozone is the Death Valley National Monument monitoring station over 100 miles to the southeast, and the closest GBVAB monitoring station to the CD-IV Project site that monitors PM2.5 is the Keeler-Cerro Gordo monitoring station approximately 90 miles to the south-southeast. Ozone, PM10, and PM2.5 data from the Death Valley, Mammoth Lakes, and Keeler monitoring stations, respectively, are shown in Table 3.2-3. The ambient concentrations identified in the table are compared to the most restrictive applicable standards.

3.2.1.3 Criteria Air Pollutants

Ozone (O_3)

Ozone is not directly emitted from stationary or mobile sources, but is formed as the result of chemical reactions in the atmosphere between directly emitted nitrogen oxides (NO_x) and hydrocarbons (e.g., reactive organic gases or ROGs) in the presence of sunlight. Pollutant transport from the San Joaquin Air Basin is one source of the ozone pollution experienced in Mono County. The 1- and 8-hour ozone concentrations measured in the GBVAB have been very slowly decreasing over time. The available data indicate that the ozone violations occurred primarily during the sunny and hot periods, typically during May through September.

TABLE 3.2-3
CRITERIA POLLUTANT MAXIMUM AMBIENT CONCENTRATIONS

Pollutant	Averaging Period	Units	2005	2006	2007	2008	2009	2010	Limiting AAQS[a]
Ozone[b]	1 hour	ppm	0.105	0.092	0.107	0.098	0.098	0.081	0.09
Ozone[b]	8 hours	ppm	0.101	0.088	0.094	0.094	0.086	0.076	0.07
PM10[c]	24 hours	$\mu g/m^3$	70.0	65.0	56.0	79.0	97.0	85.0	50
PM10[c]	Annual	$\mu g/m^3$	19.4	16.7	14.5	18.8	16.0	16.5	20
PM2.5[d]	24 hours	$\mu g/m^3$	22.0	193.0	57.0	58.0	69.0	106.2	35
PM2.5[d]	Annual	$\mu g/m^3$	---	---	5.8	7.1	---	---	12

NOTES:
[a] The limiting AAQS is the most stringent of the CAAQS or NAAQS for that pollutant and averaging period.
[b] Ozone data was collected from the Death Valley National Monument monitoring station.
[c] PM10 data was collected from the Mammoth Lakes-Gateway HC monitoring station.
[d] PM2.5 data was collected from the Keeler-Cerro Gordo monitoring station. Exceptional PM concentration events, such as those caused by wind storms or fires are not shown where excluded by USEPA; however, some exceptional events may still be included in the data presented.

--- indicates that data were not available.

SOURCE: CARB, 2012c.

Nitrogen Dioxide (NO_2)

The entire GBUAPCD is classified as attainment for the state and federal 1-hour and annual NO_2 standards. Approximately 90 percent of the NO_x emitted from combustion sources is nitric oxide (NO), while the balance is NO_2. NO is oxidized in the atmosphere to NO_2, but some level of photochemical activity is needed for this conversion. The highest concentrations of NO_2 typically occur during the fall. The winter atmospheric conditions can trap emissions near the ground level, but lacking substantial photochemical activity (i.e., sunlight), NO_2 levels tend to be relatively low. In the summer, the conversion rates of NO to NO_2 are high, but the relatively high temperatures and windy conditions disperse pollutants, preventing the accumulation of NO_2.

Carbon Monoxide (CO)

GBUAPCD is classified as attainment for the state and federal 1- and 8-hour CO standards. The highest concentrations of CO occur when low wind speeds and a stable atmosphere trap the pollution emitted at or near ground level. These conditions occur frequently in the wintertime late in the afternoon, persist during the night, and may extend 1 or 2 hours after sunrise. The CD-IV Project area has a lack of significant mobile source emissions and has CO concentrations that are well below the state and federal ambient air quality standards.

Particulate Matter (PM10) and Fine Particulate Matter (PM2.5)

PM10 can be emitted directly or it can be formed many miles downwind from emission sources when various precursor pollutants interact in the atmosphere. The CD-IV Project area in the GBVAB is classified as non-attainment for both state and federal PM10 standards. Table 3.2-3 shows recent PM10 and PM2.5 concentrations, and shows clear exceedances of the state 24-hour PM10 standard. It should be noted that exceedance does not necessarily mean violation or non-attainment, as exceptional events do occur and some of those events, which do not count as violations, may be included in the data.

Fine particulate matter, or PM2.5, is derived mainly either from the combustion of materials, or from precursor gases (SO_x, NO_x, and ROG) through complex reactions in the atmosphere. PM2.5 consists mostly of sulfates, nitrates, ammonium, elemental carbon, and a small portion of organic and inorganic compounds. The GBVAB is classified as attainment for both state and federal PM2.5 standards; however, as indicated in Table 3.2-3, PM2.5 concentrations did exceed the federal 24-hour standard during the 6-year study period.

Sulfur Dioxide (SO_2)

The entire GBUAPCD is classified as attainment for the state and federal SO_2 standards. SO_2 is typically emitted as a result of the combustion of a fuel containing sulfur. No monitoring stations in the vicinity of the CD-IV Project measure SO_2.

3.2.1.4 Sensitive Receptors

For the purposes of this air quality analysis, sensitive receptors are defined as facilities and land uses that include members of the population that are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples include schools, hospitals, and daycare centers. The reasons for greater than average sensitivity include pre-existing health problems, proximity to emissions sources, and/or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, which results in greater exposure to ambient air quality.

There are no sensitive receptors (e.g., schools, hospitals, daycare centers, long-term care facilities, residences) located within the immediate vicinity of the Proposed Action or alternative sites. However, Shady Rest Park, a Town of Mammoth Lakes sports complex, is approximately 160 feet southeast of proposed Well Site 38-25. Mammoth Elementary, Middle, and High Schools are all between approximately 0.9 and 1.1 miles from proposed Well Site 38-25, and are over 2 miles from the proposed power plant site. The closest residence to the proposed power plant site is at Chance Ranch, approximately 1.6 miles to the southeast, and the closest residences to a proposed well site are along Trails End Road, approximately 0.8 mile southwest of Well Sites 38-25 and 50-25.

Additionally, the CD-IV Project area is used year round for recreational purposes including cross country skiing, hiking, snowshoeing, and other recreational activities. The closest concentrated recreational land use to any Proposed Action or alternative sites is the Shady Rest Campground, approximately 0.5 mile to the west-southwest of Well Site 38-25. Sherwin Creek Campground is located approximately 1.6 miles to the southwest of the proposed power plant site and 0.9 mile from Well Site 55-61.

Additionally, the CD-IV Project is located near two Federal Class I air quality areas: the John Muir Wilderness is located about 2.5 miles to the south, and the Ansel Adams Wilderness is located about 10 miles to the west (USEPA, 2011b).

3.2.2 Applicable Regulations, Plans, and Policies/ Management Goals

3.2.2.1 Federal

The USEPA is responsible for implementing the programs established under the federal Clean Air Act, such as establishing and reviewing the federal AAQS and judging the adequacy of State Implementation Plans (SIPs), but has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented.

GBUAPCD is responsible for issuing federal New Source Review (NSR) permits and has been delegated enforcement of the New Source Performance Standards (NSPS). The federal NSR program requires air quality construction and operating permits (i.e., NSR air quality permits) for stationary sources when they exceed specific emissions thresholds for non-attainment pollutants, and require Prevention of Significant Deterioration (PSD) air quality permits when specific emissions thresholds are exceeded for attainment pollutants. The NSPS are emission control/performance standards for specific types of stationary sources, such as boilers, cement kilns, gas turbines, etc. The Project would include stationary sources of air pollution that would trigger federal NSR permitting per 40 CFR Part 52 and 40 CFR Part 60.

The CD-IV Project site is located in a federal non-attainment area for PM10 and therefore the CD-IV Project would be subject to the general conformity regulations (40 CFR Parts 51 and 93). In addition, the USEPA has set emission standards for non-road diesel engines, including those that would be used to construct the CD-IV Project. These standards are published in 40 CFR Part 89.

The USEPA has designated Class 1 federal lands which include areas such as national parks, national wilderness areas, and national monuments. Class I air quality areas are granted special air quality protections under Section 162(a) of the federal Clean Air Act. 40 CFR section 51.307 requires the operator of any new major stationary source located within 100 kilometers of a Class I Area to contact the Federal Land Managers for that area. However, the Proposed Action would not be considered a stationary source because it would emit less than 100 tons per year of any pollutant.

3.2.2.2 State

As discussed above in Section 3.2.1.2, CARB has established state AAQS for many of the same pollutants covered by the federal AAQS that are as stringent, or more stringent, than the federal AAQS. Pollutants regulated under these standards include ozone, NO_2, CO, PM10, PM2.5, SO_2, lead, sulfates, H_2S, vinyl chloride, and visibility reducing particles. Additional information regarding the state AAQS that are relevant to the CD-IV Project is provided in Section 3.2.1.2.

CARB also has on-road and off-road engine emission reduction programs that would indirectly affect the CD-IV Project's emissions through the phasing in of cleaner on-road and off-road equipment engines. Additionally, CARB has a Portable Equipment Registration Program that allows owners or operators of portable engines and associated equipment, such as well drill rigs, to register their units under a statewide portable program to operate their equipment, which must meet specified program emission requirements, throughout California without having to obtain individual permits from local air districts.

In 1990, the State of California administratively listed under Proposition 65 the particulates formed in the exhaust of diesel-powered equipment and vehicles as a chemical known to the state to cause cancer. California has also enacted a regulation for the reduction of Toxic air contaminants (TACs) in the form of diesel particulate matter (DPM) and criteria pollutant emissions from in-use off-road diesel-fueled vehicles (13 CCR §2449). This regulation provides target emission rates that reduce over time for PM and NO_x emissions for three specific fleets sizes of diesel-fueled off-road vehicles (CARB, 2011b).

3.2.2.3 Local

Great Basin Unified Air Pollution Control District

The Project site is within the jurisdiction of the GBUAPCD, which regulates air pollutant emissions for all stationary sources in the GBUAPCD. The GBUAPCD enforces regulations and administers permits governing stationary sources by limiting emissions of criteria air pollutants, air pollutants that can react in the air to create criteria air pollutants (known as "precursors"), and toxic air pollutants. Projects that may emit air pollutants or their precursors are required by GBUAPCD regulations to apply for, receive, and comply with the conditions of air quality permits. The CD-IV Project would be required to obtain an Authority to Construct/Permit to Operate from the GBUAPCD for each of the two binary geothermal power plant units. The CD-IV Project would also be required to obtain separate Permits to Operate for each piece of fuel-burning stationary equipment that would be operated on the site (e.g., diesel-fueled emergency generator and firewater pump generator).

The GBUAPCD has also developed rules and regulations for emissions from geothermal sources. Rule 404-A regulates particulate matter discharges from geothermal well drilling. Maximum sulfur and H_2S emission levels from geothermal plants, wells, and miscellaneous steam supplies are limited to 2.5 kilograms per hour per source (kg/hr/source), as specified by Rule 424.

Air Quality Management Plan for the Town of Mammoth Lakes

As required by the federal Clean Air Act and the California Clean Air Act, air basins or portions thereof have been classified as in either attainment or non-attainment of each criteria air pollutant, based on whether or not the standards have been achieved. Jurisdictions of non-attainment areas are also required to prepare an air quality attainment plan that includes strategies for achieving attainment. The GBUAPCD's attainment plan applicable to the CD-IV Project area was adopted on November 30, 1990. The purpose of the Air Quality Management Plan was to implement a PM10 State Implementation Plan to bring the area into compliance with federal and state PM10 air quality standards. The plan adopted regulations that phased out non-certified wood stoves and fireplaces, limited the installation of stoves and fireplaces to one certified unit per residence, prohibited trash and coal burning, and established triggers for no burn days (GBUAPCD and Town of Mammoth Lakes, 1990).

Mono County General Plan

The Mono County General Plan Conservation/Open Space Element provides direction specific to geothermal exploration and development via the Energy Resources Section. Objective G of Goal 1 establishes requirements to prevent violations of state or federal air quality standards or the rules and regulations of the GBUAPCD, and would be applicable to the CD-IV Project. Objective G states that "The permit holder shall establish procedures that ensure that neither geothermal exploration nor development will cause violations of state or federal ambient air quality standards or the rules and regulations of the GBUAPCD." (Mono County, 2012)

3.3 Biological Resources – Vegetation

This section describes the environmental setting; vegetation communities; invasive, noxious weeds; special status plant species; and state and federal jurisdictional areas that are present or have the potential to occur on the CD-IV Project site. It also discusses the regulatory framework associated with vegetation resources that may be present in the CD-IV Project area.

This discussion is based, in part, upon information from these sources:

1. Focused botanical surveys performed in 2002, 2008, 2009, and 2010 (Paulus, 2002; 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010);
2. A delineation of wetlands and waters of the U.S. (Paulus, 2012);
3. Noxious Weed Risk Assessment, Upper Basalt Geothermal Exploration Project (USFS Inyo National Forest, 2005a);
4. Biological Evaluation Sensitive Plant Species; Upper Basalt Geothermal Exploration Project, Inyo National Forest (Environmental Management Associates, Inc., 2005);
5. Amended Biological Evaluation Sensitive Plant Species; Upper Basalt Geothermal Exploration Project, Inyo National Forest (USFS Inyo National Forest, 2005b);
6. The California Natural Diversity Database (CNDDB) (CDFG, 2012);
7. The California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS, 2012); and
8. CalFlora (2012).

The Project area for vegetation resources includes National Forest System lands administered by Inyo National Forest. The Project area where vegetation communities were characterized and special-status plant and noxious weed surveys were performed included the immediate footprint for the geothermal power plant site(s), the geothermal well sites, and a 300-foot wide survey corridor for pipeline routes. Surveys for new access roads will be conducted in spring and summer, 2013.

3.3.1 Environmental Setting

3.3.1.1 Regional Setting

The CD-IV Project is located in an ecologically diverse transition zone between the lower elevations of the eastern slope of the Sierra Nevada on the west and the Great Basin on the east. The Project area is situated within the Long Valley caldera at the southern base of a volcanic resurgent dome. The climate at these elevations is montane, with temperatures ranging from temperate to cold, and arid to low humidity. The montane climate is influenced by a rain shadow effect due to the close proximity of the steep eastern escarpment of the Sierra Nevada Mountains to the west. Average annual precipitation in the vicinity of the Proposed Action is 23.2 inches, and average annual snowfall is 209.6 inches. The xeric summer months are irregularly interrupted by heavy rains from thunderstorms. Mean maximum temperature is approximately 56.5° F and mean minimum temperature is approximately 28.8° F (WRCC, 2012).

3.3.1.2 Project Setting

The CD-IV power plant would be located in Sections 29 and 32, Township 3 South, and Range 28 East MD B&M. This location is east of U.S. Highway 395 and approximately ½-mile to the northwest of the three existing geothermal power plants, which are about two miles east of the Town of Mammoth Lakes in Mono County, California. The CD-IV Project's geothermal resource wells and pipelines would be located within the Inyo National Forest in Section 25, 26, and 36 of T3S, R27E and Sections 30, 31 and 32 of T3S, R28E, MD B&M. The majority of the Project area is undeveloped, with scattered unimproved roads traversing the area.

Within the Project area, terrain is variable between nearly level to gently rolling slopes with scattered steeper slopes. Elevations range from approximately 7,880 feet at the highest proposed well pad site in the northwest portion of the Project area and 7,200 feet at the lowest proposed well pad site in the southeast of the Project area. Drainage is generally to the southeast. Natural ephemeral washes and swales drain the Project area, eventually flowing to Mammoth Creek south of the CD-IV Project site.

3.3.1.3 Vegetation Communities

Vegetation communities are assemblages of plant species that occur together in the same area, which are defined by species composition and relative abundance. Vegetation communities were described using *A Manual of California Vegetation, 2nd Edition* (Sawyer et al., 2009). Vegetation communities were identified in previous technical reports (Paulus, 2002, 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010). Each of these reports was reviewed by ESA biologists prior to their reconnaissance survey. Table 3.3-1 presents site-specific vegetation information. Two vegetation communities dominate the Project area: Jeffrey pine forest and sagebrush scrub. The Project area also supports smaller areas of Wright buckwheat dwarf scrub and single-leaf pinyon woodland. Unvegetated sites within the Project area include areas that have been thermally or mechanically disturbed. Mechanically disturbed sites are devoid of vegetation as a result of ongoing human uses. Thermally disturbed sites are unsuitable for native vegetation.

Jeffrey Pine Forest

Jeffrey pines (*Pinus jeffreyi*) exist in the Project area as the dominant overstory species, occurring in pure stands of various size second-growth, as well as scattered individual trees of various sizes. Singleleaf pinyon (*Pinus monophylla*) and Sierra juniper (*Juniperus grandis*) are minor canopy components that are present within the study area in clumped distributions. Understory vegetation density and diversity within the Jeffrey Pine Forest are related to tree canopy cover. Dense tree cover builds leaf litter and shading, limiting understory vegetation. Gaps in tree cover increase understory vegetation and species diversity. Understory vegetation consists of sagebrush (*Artemisia tridentata*), antelope bush (*Purshia tridentata*), and perennial grasses comprising ground cover averaging 40 to 50 percent. Other understory species include currant (*Ribes cereum*)

TABLE 3.3-1
PROJECT VEGETATION COMMUNITIES

Project Area	Vegetation Communities	Constraints	Data Sources
Proposed Action Power Plant Site	Jeffrey Pine Forest (100%)		Paulus 2002
Alternative 2 Power Plant Site	Jeffrey Pine Forest (60%) Sagebrush Scrub (40%) (approximately)		Review of aerial photographs and site reconnaissance; Paulus 2002 (in part); studies to be conducted
Well 12-25	Mechanically disturbed (well completed)		Paulus 2009f
Well 14-25	Mechanically disturbed (well completed)		Paulus 2009e
Well 15-25	Jeffrey Pine Forest (100%)		Paulus 2009e
Well 25-25	Jeffrey Pine Forest (100%)		Paulus 2009e
Well 34-25	Jeffrey Pine Forest (90%) Sagebrush Scrub (10%)		Paulus 2009e
Well 38-25	Jeffrey Pine Forest (100%)	Cheat grass present.	Paulus 2008; Paulus 2009e
Well 50-25			No site specific study; studies at this will site will conducted
Well 56-25	Sagebrush Scrub (50%) Jeffrey Pine Forest (50%)	Pine fritillary present	Paulus 2009e
Well 81-36	Sagebrush Scrub (90%) Jeffrey Pine Forest (10%)	Cheat grass present.	Paulus 2008; Paulus 2009d
Well 77-25	Sagebrush Scrub (60%) Jeffrey Pine Forest (40%)	Pine fritillary present. Cheat grass present.	Paulus 2009e
Well 26-30	Sagebrush Scrub (85%) Jeffrey Pine Forest (15%)		Paulus 2009f
Well 12-31	Sagebrush Scrub (100%)	Cheat grass present.	Paulus 2008; Paulus 2009d
Well 12A-31	Sagebrush Scrub (100%)		Paulus 2009d
Well 23-31	Sagebrush Scrub (100%)	Cheat grass present.	Paulus 2008; Paulus 2009d
Well 35-31	Sagebrush Scrub (90%) Jeffrey Pine Forest (10%)	Cheat grass present.	Paulus 2008; Paulus 2009d
Well 55-31	Sagebrush Scrub (95%) Jeffrey Pine Forest (5%)	Cheat grass and Russian thistle present.	Paulus 2008; Paulus 2009d
Well 55-32	Mechanically disturbed		Paulus 2009b
Well 65-32	Mechanically disturbed		Paulus 2009b
Proposed Action Pipeline alignment	Jeffrey Pine Forest and Sagebrush Scrub	Cheat grass present.	Paulus 2009c Paulus 2009b Paulus 2009f
Alternative 3 – Modified Pipeline Alignment			No site-specific studies on differences; studies to be conducted

and snowberry (*Symphoricarpos rotundifolius*). Jeffrey pines are located at the regional transition zone from the mixed scrub of the lower elevations of Long Valley to the conifer forests of the higher elevations of the eastern Sierra Nevada slopes. Total forest tree canopy closure in the study area average from 10 to 40 percent with scattered 40 to 70 percent closure at the sub-patch scale with scattered dead snags. The boundary between the forest and scrub is often indistinct and is found as singular trees to small clumps of several trees to more continuous stands near the north and west edges of the Project area.

Sagebrush Scrub

This community is dominated by sagebrush and antelope bush, which provide an average cover of approximately 30 to 50 percent. Rabbit goldenbush (*Ericameria bloomeri*) is a co-dominant in a small number of areas. Perennial grasses (approximately 10 percent cover) such as squirreltail grass (*Elymus elymoides*), intermediate wheatgrass (*Elymus hispidus*), needle-and-thread grass (*Stipa comata*), needlegrasses (*Stipa occidentale* and *S. nevadensis*), and Great Basin wild rye (*Elymus cinereus*) are also present and sometimes comprise a significant portion of the total cover. Jeffrey pine stands occur primarily at the edges of the sagebrush but do not encroach extensively into the scrub community. Intermediate wheatgrass has established up to 20 percent cover at the community's ecotone with mechanically disturbed areas. Cheat grass (*Bromus tectorum*) is the only non-native species whose abundance in 2008 was on average greater than the abundances of co-occurring native species where soil disturbance is not evident.

Wright Buckwheat Dwarf Scrub

Wright Buckwheat Dwarf Scrub is restricted to perennially warmed soils near fumaroles[1]. This community occurs in patches near the existing powerplants. Wright buckwheat (*Eriogonum wrightii* var. *subscaposum*) is not the only shrub present, but it is overall the most conspicuous because its mats make up more than 90 percent of the total cover. Co-occurring sagebrush and antelope bush are sparse and stunted. The average vegetation cover is 10 to 20 percent and average height is less than one foot, but areas that have been invaded by "winter annuals" (see below) can produce dense cover averaging three feet tall for at least part of each year. Wright Buckwheat Dwarf Scrub community ecotones are characteristically sharp. Its boundaries are readily visible where the open patches of Wright buckwheat grade abruptly into surrounding, more densely vegetated forest and scrub communities. Like other plant communities in the project area, Wright Buckwheat Dwarf Scrub has been fragmented by past development.

The occurrence of nearly pure stands of the small shrub Wright buckwheat may represent a rare combination of native plants that is confined to fumarole field margins. Wright buckwheat is not itself a rare plant in California. The community, however, is currently classified by the CDFG as G4S3?, signifying that it is "vulnerable and at moderate risk" (the question mark signifies CDFG uncertainty due to a lack of comprehensive distribution data), and thus would be considered sensitive by the State of California. The principal threat to this community's continued

[1] A *fumarole* is an opening in the earth's crust which emits steam and gases.

existence within the Project area is the proximity to active fumaroles and soils heated beyond the tolerance of plants.

Heated soils that support Wright Buckwheat Dwarf Scrub are vulnerable to dense growths of non-native annuals that are typically found in disturbed habitats at lower elevations. Collectively termed "winter annuals" in recognition of their adaptation to early-season growth and subsequent stand dominance over native annuals that germinate later in spring, non-native species such as black mustard (*Brassica nigra*), redstem filaree (*Erodium cicutarium*), tumble mustard (*Sisymbrium altissimum*), and clasping pepperweed (*Lepidium perfoliatum*) were very abundant in 2008 but appeared to be mostly restricted to the edges of this community. Cheat grass, in contrast, has attained up to 20 percent absolute cover in a continuous stand across the entirety of this community's extent within the Project area (Paulus, 2009a; 2009b).

Singleleaf Pinyon Woodland

Singleleaf Pinyon Woodland within the Project area is limited in distribution. Jeffrey pine is absent, with the exception of a few seedlings and long-dead snags. Singleaf pinyon has established dominance with a clumped distribution that averages 20 percent canopy closure. Mountain juniper is a minor canopy component. Sagebrush and antelope bush are overall dominants in the shrub layer, while native perennial grasses and cheat grass dominate in the herb layer. This community occurs between active fumaroles and upslope of other Project area communities, in a landscape position that may encourage diversity of shallow-rooted species by providing rooting zone soils that are moderately warmed all year (but apparently warm enough to kill large Jeffrey pine) (Paulus, 2009a; 2009b).

Thermally Disturbed

Non-native annuals such as cheat grass, redstem filaree, black mustard, Russian thistle (*Salsola tragus*), and silver hairgrass (*Aira caryophyllea*) attain weedpatch dominance and up to 90 percent cover where recent thermal activity has killed native shrubs and trees. The only native annual species found widely in thermally disturbed areas were skunky monkeyflower (*Mimulus nanus* var. *mephiticus*) and goosefoot (*Chenopodium* sp.). Scattered woollypod milkvetch (*Astragalus purshii*) and pussypaws (*Calyptridium monospermum*) were found at low frequencies among the non-native "winter annuals" (see Wright Buckwheat Dwarf Scrub, above), but perennial species in general occur only rarely. All surfaces within about 20 feet of active fumaroles are barren.

Mechanically Disturbed

Areas that have been mechanically disturbed within the past decade are dominated by non-native perennial grasses. Intermediate wheatgrass and crested wheatgrass (*Agropyron cristatum*) were probably introduced in revegetation seed mixes. Dominants that are typical of nearby Sagebrush Scrub have not returned to disturbed areas, but native rabbitbrush (*Ericameria nauseosa* and *E. parryi*) shrubs occur patchily. Species observed to be restricted to the areas of greatest ongoing disturbance (*e.g.*, where topsoil has been scraped away for recent well pad or road construction) included cheat grass, Russian thistle, California willowherb (*Epilobium foliosum*), yellow salsify (*Tragopogon dubius*), and common knotweed (*Polygonum aviculare* ssp. *depressum*). Gravelcapped pads remain nearly barren. Meanwhile, several pipeline corridors that cross through the Project area (pipelines are elevated on 1-2 feet stilts) have attained a high degree of native vegetative recovery. Pipeline corridors constructed in the early 1990s are now largely indistinguishable from the surrounding vegetation types.

3.3.1.4 Invasive, Noxious Weeds

Noxious weeds are species of non-native plants included on the weed lists of the California Department of Food and Agriculture (CDFA) (2010), the California Invasive Plant Council (Cal-IPC), or those weeds of special concern identified by the BLM. They are of particular concern in wild lands because of their potential to degrade habitat and disrupt the ecological functions of an area (Cal-IPC, 2006). Specifically, noxious weeds can alter habitat structure, increase fire frequency and intensity, decrease forage (including for special status species), exclude native plants, and decrease water availability for both plants and wildlife. Soil disturbance creates conditions favorable to the introduction of new noxious weeds or the spread of existing populations. Construction equipment, fill, and mulch can act as vectors introducing noxious weeds into an area.

During the special-status plant surveys conducted in 2008, 2009, and 2010 (see Section 3.4.1.5), 24 non-native species were recorded. Of these, nine are listed in the Cal-IPC Invasive Plant Inventory Database (Cal-IPC, 2006; Table 3.3-2). None of these species are included on the Federal Noxious Weed List (7 CFT 360; USDA, 2012). The bull thistle (*Cirsium vulgare*) is included on the Noxious Weed List – Section 4500 of the Food and Agriculture Code (California Department of Food and Agriculture, 2012). Noxious weeds found in the Project area are discussed further below.

Black mustard (*Brassica nigra*) is a winter annual forb. Like other mustards, black mustard grows profusely and produces allelopathic chemicals that prevent germination of native plants. The spread of black mustard can increase the frequency of fires in a variety of vegetation communities, changing these habitats to annual grassland (Cal-IPC, 2006).

Cheatgrass (*Bromus tectorum*) is likely the most problematic of the non-native species present within the Project area. High density cheat grass stands are thought to increase the risk and frequency of wildfire (Cal-IPC, 2006). It has become well-established in thermally and mechanically disturbed soils throughout Casa Diablo and adjoining geothermally active areas and, with Russian thistle, has invaded into nearby relatively undisturbed Jeffrey Pine forest and Sagebrush Scrub. Soil disturbance associated with the CD-IV Project could contribute to the ongoing local spread of invasive cheat grass, Russian thistle and other invasive weeds. In areas that are both mechanically and thermally disturbed, existing populations of non-natives adapted to thermal disturbance will be encouraged, but this will not likely cause spread of these species into adjacent non-thermal habitats.

Bull thistle (*Cirsium vulgare*) is a perennial or biennial forb that is widespread in California and is most common in coastal grasslands, along edges of fresh and brackish marshes, and in meadows and mesic forest openings in the mountains below 7,000 feet. It is most troublesome in recently or repeatedly disturbed areas such as pastures, overgrazed rangelands, recently burned

TABLE 3.3-2
INVASIVE, NOXIOUS WEEDS OBSERVED IN THE PROJECT AREA

Scientific Name **Common Name**	**Overall Cal-IPC Rating[a]**	**Cal-IPC Level of Invasiveness**
Brassica nigra black mustard	Moderate	Moderate
Bromus tectorum cheatgrass	High	Moderate
Cirsium vulgare bull thistle	Moderate	Moderate
Dactylis glomerata orchardgrass	Limited	Moderate
Descurainia Sophia tansy mustard	Limited	Moderate
Erodium cicutarium red-stem filaree	Limited	Limited
Rumex crispus curly dock	Limited	Limited
Salsola tragus Russian thistle	Limited	Moderate
Verbascum thapsus common mullein	Limited	Moderate

[a] **High** – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
Moderate – These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

forests and forest clearcuts, and along roads, ditches, and fences. Besides out-competing native plant species for water, nutrients, and space, the presence of bull thistle in hay decreases feeding value and lowers market price (Cal-IPC, 2006).

Orchardgrass (*Dactylis glomerata*) is an aggressive perennial grass widespread throughout California. It grows in any type of soil, is drought resistant, and can overrun-some grasslands. Orchardgrass is a desirable pasture grass but has escaped cultivation in many natural areas throughout the United States (Cal-IPC, 2006).

Tansy mustard (*Descurainia sophia*) is an annual or biennial found throughout California along roadsides, in agricultural fields, disturbed desert areas, scrub, grasslands and woodlands. It is most common in the northeastern region, particular in the Great Basin. It tends to prefer well-drained sandy or stony soils. Flowering tansy mustard plants can be toxic to cattle when they are eaten over a long period of time. It produces abundant seed, which can be spread by soil or water movement, and by clinging to animals, humans and vehicle tires, but its rate of spread is relatively slow except in disturbed areas. Tansy mustard may invade recently disturbed areas and then become less dominant as native species become re-established (Cal-IPC, 2006).

Redstem filaree (*Erodium cicutarium*) is an aggressive annual/biannual that is very widespread throughout California and is commonly found along roadsides, grasslands, fields, and semi-desert areas. It often carpets large areas, out-competing native grasses and forbs (Cal-IPC, 2006).

Curly dock (*Rumex crispus*) is a perennial forb found throughout California. It can grow in many habitats, including grassy places, waste ground, roadsides and near sand dunes but is primarily found in flood plains and in agricultural areas (Cal-IPC, 2006).

Russian thistle (*Salsola tragus*) is a large, bushy summer annual that can be found throughout California, including in agricultural areas, desert, roadsides and other disturbed areas. Russian-thistle can impede traffic, create fire hazards, and is a host of the beet leaf-hopper, an agricultural insect pest (Cal-IPC, 2006).

Common mullein (*Verbascum thaspus*) is a biennial or annual forb that occurs throughout California, but is particularly abundant in dry valleys on the eastern side of the Sierra Nevada. High population densities have been observed in moist meadows and creek drainages near Mono Lake and Owens Valley. Common mullein is a host for insects that are themselves economic pests. Common mullein seeds can survive for 35 years or more in the soil (Cal-IPC, 2006).

3.3.1.5 Special Status Plant Species

Special-status plant species are legally protected under state and federal Endangered Species Acts or other regulations and species that are considered sufficiently rare by the scientific community to qualify for such listing. These species are in the following categories:

1. Plants listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 Code of Federal regulations [CFR] 17.12 [listed plants], 17.11 [listed animals] and various notices in the Federal Register [FR] [proposed species]).
2. Plants that are candidates for possible future listing as threatened or endangered under the federal Endangered Species Act (61 FR 40, February 28, 1996);
3. Plants listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (14 California Code of Regulations [CCR] 670.5);
4. Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.);
5. Plants that meet the definitions of rare and endangered under CEQA. CEQA Section 15380 provides that a plant or animal species may be treated as “rare or endangered” even if not on one of the official lists (State CEQA Guidelines, Section 15380);

6. Plants considered under the CNPS to be "rare, threatened or endangered in California" (Rank 1A, 1B, and 2 in CNPS, 2012) as well as CNPS Rank 3 and 4[2] plant species;
7. Plants ranked by CNPS as plants about which more information is needed to determine their status (Rank 3 in CNPS, 2012), which may be included as special-status species on the basis of local significance or recent biological information;
8. Plants listed as Sensitive by the BLM; and
9. Plants designated as Sensitive by the USFS.

A list of special-status plant species that have the potential to occur within the vicinity of the Project area was compiled based on data in CNDDB [CNDDB, (CDFG, 2012)(Figure 3.3-1)], CNPS Inventory of Rare and Endangered Plants (CNPS, 2012), and the USFWS List of Federal Endangered and Threatened Species that Occur in the Old Mammoth quadrangle (USFWS, 2012a), and USFWS List of Federal Endangered and Threatened Species that may be Affected by Projects in Mono County, CA (USFWS, 2012b).

Conclusions regarding habitat suitability and species occurrence are based on reconnaissance surveys conducted by ESA in 2010, surveys for special-status plants conducted by Jim Paulus, Ph.D, in 2008, 2009, and 2010 (Paulus 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010), as well as the analysis of existing literature and databases described previously. One special-status plant, pine fritillary, was observed within the Project area during surveys.

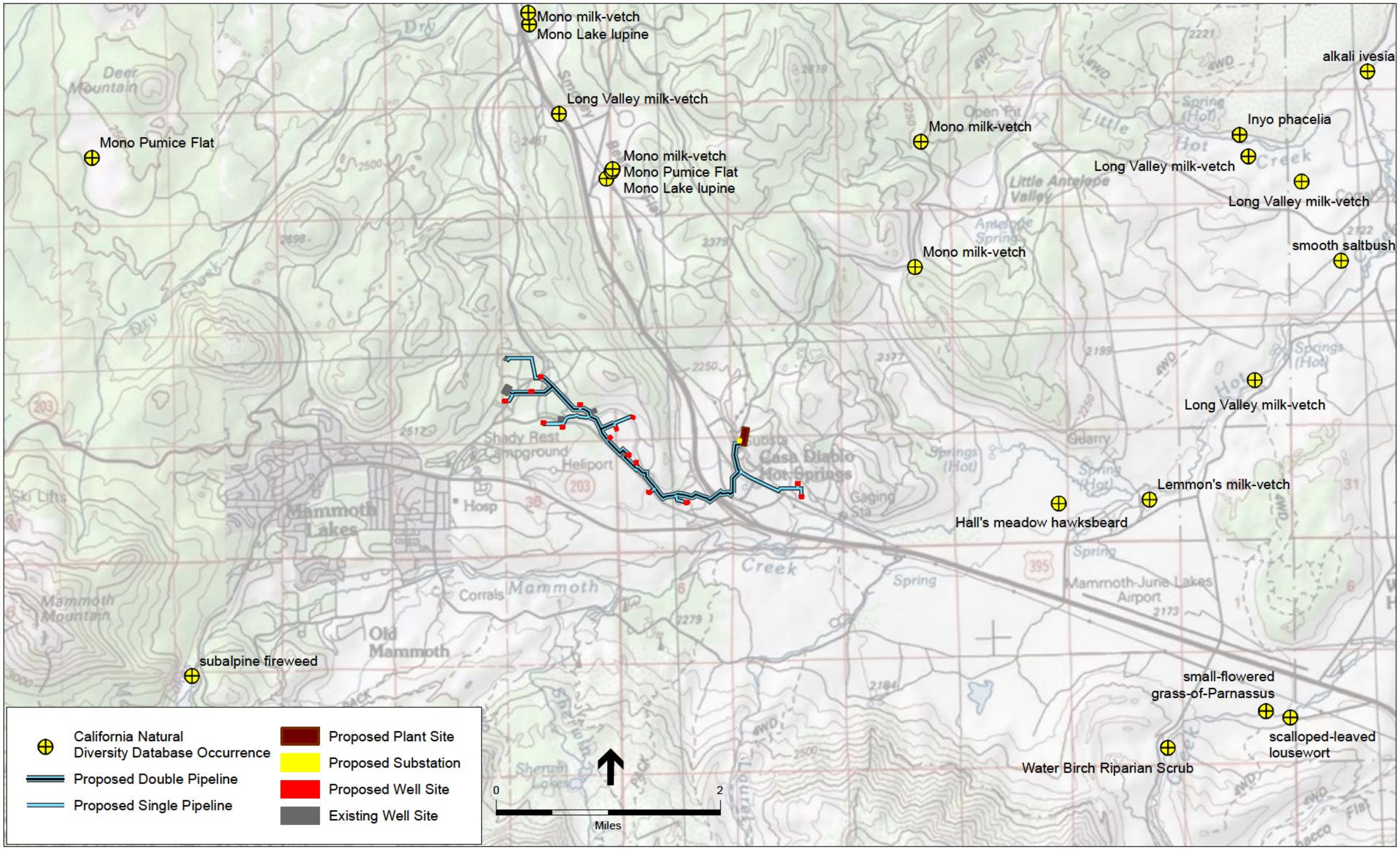
Pine Fritillary (Fritillaria pinetorum)

Status: Pine fritillary is a CNPS Rank 4.3 species, meaning it is a plant of limited distribution in California.

Distribution: This perennial bulbiferous herb is endemic to California at elevations ranging between 5,700 and 11,000 feet in Fresno, Inyo, Kern, Los Angeles, Mono, San Bernardino, Tulare, Ventura, Santa Barbara, Plumas, and Yuba counties. The CNDDB does not contain any recorded occurrences of this species.

Habitat and Biology: Pine fritillary is reported from granitic or metamorphic soils in chaparral, montane forests, subalpine coniferous forest, and pinyon and juniper woodland. Observed plants on the CD-IV Project site were found in open forest in shaded habitat with 20-30 percent canopy closure and a moderate litter layer.

[2] List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants. Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a List 4 plant are significant even if individual project impacts are not. CNPS List 3 and 4 may be considered regionally significant if, e.g., the occurrence is located at the periphery of the species' range, or exhibits unusual morphology, or occurs in an unusual habitat/substrate. For these reasons, CNPS List 3 and 4 plants should be included in the field surveys. List 3 and 4 plants are also included in the California Natural Diversity Database's (CNDDB) Special Plants, Bryophytes, and Lichens List. [Refer to the current online published list available at: http://www.dfg.ca.gov/biogeodata.] Data on Lists 3 and 4 plants should be submitted to CNDDB. Such data aids in determining or revising priority ranking.



SOURCE: Ormat, 2011; CDFG, 2012

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.3-1
Special Status Plants
in the Project Vicinity

Status in Project Site: During 2008 surveys, pine fritillary was found in two locations (wells 56-25 and 77-25) on the CD-IV Project site within Jeffrey Pine forest in the Basalt Canyon area. The total population size in the Project area is estimated to be approximately 24 individuals. As the species is somewhat cryptic, it is possible that more plants are present and that the populations extend into adjacent similar forest habitat.

Table 3.3-3 lists special-status plants with the potential to occur within the Project area. The "Potential to Occur in the Project Area" category is defined as follows:

1. ***Unlikely*****:** The CD-IV Project site and/or immediate area do not support suitable habitat for a particular species. The CD-IV Project site is outside of the species known range.
2. ***Low Potential*****:** The CD-IV Project site and/or immediate area only provide limited habitat for a particular species. In addition, the known range for a particular species may be outside of the immediate Project area.
3. ***Moderate Potential*****:** The CD-IV Project site and/or immediate area provide suitable habitat for a particular species, and habitat for the species may be impacted.
4. ***High Potential*****:** The CD-IV Project site and/or immediate area provide ideal habitat conditions for a particular species and/or known populations occur in immediate area or within the potential area of impact.

3.3.1.6 Wetlands - Federal and State Jurisdictional Areas

Regulated wetlands and other waters of the U.S. are subject to jurisdiction under Section 404 of the Clean Water Act (CWA). Wetlands are ecologically complex habitats that support a variety of both plant and animal life. An assessment of potential wetlands and other waters of the U.S. (other waters) was conducted within the CD-IV Project site by Jim Paulus, Ph.D. (Paulus, 2012). The assessment consisted of evaluating and mapping any features that could be considered jurisdictional under state and federal regulations.

Based on the assessment of wetlands and other waters of the U.S., the CD-IV Project site is located on an alluvial plain that historically has been watered by unnamed stream courses. The USGS topographic quadrangle for Old Mammoth, CA depicts an unnamed "blue line" drainage extending from two miles north of the CD-IV Project site in Upper Basalt, through Basalt Canyon and Casa Diablo, and ending about ½-mile south of the Project site at a confluence with Mammoth Creek. Similar "blue line" drainages depict potential tributaries to this stream course (again unnamed) entering near Shady Rest Park and near the Casa Diablo fumaroles zone. The USFS has designated corridors of 3400 feet in width as Riparian Conservation Areas (RCA) at every USGS "blue line" drainage in the area, including those of the Project area (Paulus, 2012).

A total of 1.89 acres of potentially jurisdictional wetlands were mapped within the Project area, all in close proximity to the existing power plant facilities. The assessment performed by Paulus (Paulus, 2012) determined that the "blue line" drainages were likely not jurisdictional under the CWA except for in the area of the existing power plants. Areas upstream from this did not exhibit continuous indicators of a defined bed and bank and an ordinary high water mark and therefore do not meet the definition of jurisdictional waters under the CWA.

TABLE 3.3-3
SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE PROJECT AREA

Scientific Name Common Name	Listing Status: Federal/State/ CNPS	General Habitat	Potential to Occur in the Project Area
Plants			
Arabis repanda var. *greenei* Greene's rock cress	--/--/4.3	Granitic, talus, rocky or sandy soils in upper montane coniferous forest and subalpine coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Astragalus argophyllus var. *argophyllus* sliverleaf milk-vetch	BLMS/--/2.2	Alkaline and saline meadows, stream banks and lake shores, in stiff alluvial clays and loams.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Astragalus johannis-howellii Long Valley milk-vetch	BLMS/FSS/SR/1B.2	Great Basin scrub. In sandy volcanic ash or pumice with sagebrush scrub.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Astragalus kentrophyta var. *danaus* Sweetwater Mountains milk-vetch	--/--/4.3	Rocky sites and talus in subalpine coniferous forest and alpine boulder and rock field.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Astragalus lemmonii Lemmon's milk-vetch	BLMS/FSS/--/1B.2	Lakeshores, meadows and seeps in Great Basin scrub.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Astragalus lentiginosus var. *piscinensis* Fish Slough milk-vetch	FT/--/1B.1	Usually found on mounds in alkali meadows with sparse vegetative cover.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Astragalus monoensis Mono milk-vetch	BLMS/FSS/SR/1B.2	Pumice flats with sparse vegetative cover in Great Basin scrub and upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Astragalus oophorus var. *lavinii* Lavin's milk-vetch	BLMS/--/1B.2	Dry, open areas in Great Basin scrub.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Astragalus pseudiodanthus Tonopah milk-vetch	BLMS/--/1B.2	Stabilized dunes and sandy flats, often with *Sarcobatus baileyi* and *Hilaria jamesii*.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Atriplex pusilla smooth saltbush	--/--/2	Great Basin scrub, meadows and seeps. Known from hot springs, alkali springs.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Boechera bodiensis Bodie Hills rock-cress	BLMS/FSS/1B.3	In rock crevices, outcrops, and on steep slopes in alpine boulder and rock fields, Great Basin scrub, Pinyon-Juniper woodland, and subalpine coniferous forest. Granitic and volcanic substrates.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Boechera cobrensis Masonic rock-cress	--/--/2.3	Sandy soils under shrubs in semi-desert.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Boechera pinzliae Pinzl's rock-cress	FSS/--/1B.3	Alpine boulder and rock field, subalpine forest. On north-facing slopes in steep, unstable scree and sand.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Boechera tularensis Tulare rock-cress	--/--/1B.3	Rocky slopes in subalpine coniferous forest and upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.

TABLE 3.3-3 (Continued)
SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State/ CNPS	General Habitat	Potential to Occur in the Project Area
Plants (cont.)			
Botrychium ascendens upswept moonwort	FSS/--/2.3	Grassy fields, near springs and creeks in lower montane coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Botrychium crenulatum scalloped moonwort	FSS/--/2.2	Bogs and fens, moist meadows, freshwater marsh, near creeks.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Bruchia bolanderi Bolander's bruchia	FSS/--/2.2	Moss which grows on damp clay soils. Seems to colonize bare soil along streambanks, meadows, fens and springs in lower montane coniferous forest and upper montane coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Calochortus excavatus Inyo County star-tulip	BLMS/FSS/--/1B.1	Mostly on fine, sandy loam soils with alkaline salts, grassy alkaline meadows in shadscale scrub.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Camissonia boothii ssp. *boothii* Booth's evening-primrose	--/--/2.3	Joshua tree woodland, pinyon-juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Carex incurviformis var. *danaensis* Mount Dana sedge	--/--/4.3	Alpine boulder and rock field.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Carex scirpoidea ssp. *pseudoscirpoidea* western single-spiked sedge	--/--/2.2	Often on limestone. Mesic sites in alpine boulder and rock fields, subalpine coniferous forests, meadows and seeps.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Claytonia megarhiza fell-fields claytonia	--/--/2.3	In the crevices between rocks, on rocky or gravelly soil, in alpine fell fields and subalpine coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Crepis runcinata ssp. *hallii* Hall's meadow hawksbeard	--/--/2.1	Moist, alkaline valley bottoms in Mojavean desert scrub and pinyon-juniper woodland.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Cryptantha roosiorum bristlecone cryptantha	BLMS/FSS/SR/1B.2	On gentle slopes or flats of dolomite or limestone formations in bristlecone pine/limber pine forest.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Cusickiella quadricostata Bodie Hills cusickiella	BLMS/--/--/1B.2	Endemic to the Walker River drainage; mainly confined to shallow decomposed granite or clay soils in Great Basin scrub and Pinyon-Juniper woodland.	Unlikely – Project area is outside of species range. Species not observed during plant surveys.
Dedeckera eurekensis July gold	BLMS/FSS/SR/1B.3	On rocky ridges, cliffs, and talus slopes, and sometimes in washes, in Mojavean desert scrub. Restricted to carbonate soils	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Draba cana canescent draba	--/--/2.3	Alpine boulder and rock field, subalpine coniferous forest. In California, known only from two occurrences near Lake Genevieve and Wheeler Peak.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.

TABLE 3.3-3 (Continued)
SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State/ CNPS	General Habitat	Potential to Occur in the Project Area
Plants (cont.)			
Draba incrassata Sweetwater Mountains draba	FSS/--/1B.3	Endemic to the rhyolite substrates of the Sweetwater Mountains, on loose, steep talus slopes.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Draba lonchocarpa var. *lonchocarpa* spear-fruited draba	--/--/2.3	On limestone scree in alpine boulder and rock fields.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Draba praealta tall draba	--/--/2.3	Montane or subalpine moist meadows, streambanks, forest, talus, and shale cliffs.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Elymus scribneri Scribner's what grass	--/--/2.3	On rocky slopes in alpine boulder and rock fields.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Epilobium howellii subalpine fireweed	FSS/--/4.3	Wet meadows and mossy seeps in subalpine coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Ericameria nana dwarf goldenbush	--/--/4.3	Rocky, carbonate or granitic soils in pinyon and juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Eriogonum eremicola Wildrose Canyon buckwheat	BLMS/--/1B.3	Sandy or gravelly sites in yellow pine and bristlecone pine forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Eriogonum microthecum var. *alpinum* northern limestone buckwheat	--/--/4.3	Sometimes rocky or gravelly soils in Great Basin scrub and alpine dwarf scrub.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Eriogonum microthecum var. *panamintense* Panamint Mountains buckwheat	BLMS/--/1B.3	Rocky soils in pinyon-juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Fritillaria pinetorum **pine fritillary**	**--/--/4.3**	**Granitic or metamorphic soils in chaparral, lower montane coniferous forest, upper montane coniferous forest, pinyon and juniper woodland, and subalpine coniferous forest.**	**Present – Species observed during plant surveys.**
Goodmania luteola golden goodmania	--/--/4.2	Alkaline or clay soils in Mojavean desert scrub, playas, valley and foothill grassland, and meadows and seeps.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Helodium blandowii Blandow's bog moss	FSS/--/2.3	Moss growing on damp soil, especially under willows among leaf litter in meadows, seeps, bogs, fens and subalpine coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Hesperidanthus jaegeri Jaeger's caulostramina	BLMS/FSS/1B.2	Shady, rocky, limestone crevices in pinyon-juniper woodland and subalpine coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.

TABLE 3.3-3 (Continued)
SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State/ CNPS	General Habitat	Potential to Occur in the Project Area
Plants (cont.)			
Hulsea brevifolia short-leaved hulsea	FSS/--/1B.2	Granitic or volcanic soil of forest openings and road cuts in upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Hulsea vestita ssp. *inyoensis* Inyo sunflower	--/--/2.2	Open gravel and talus slopes in pinyon-juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Hulsea vestita ssp. *parryi* Parry's sunflower	--/--/4.3	Granitic or carbonate rocky openings in lower montane coniferous forest, upper montane coniferous forest, and pinyon and juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Ivesia kingii var. *kingii* alkali ivesia	BLMS/--/2.2	Alkaline meadows, alkaline flats, and low-lying alkaline basins in playas and Great Basin scrub.	Unlikely – Project area provides no suitable micro-habitat (alkaline meadow). Species not observed during plant surveys.
Kobresia myosuroides seep kobresia	--/--/2.3	Moist places in alpine and subalpine meadows; can be on limestone substrate.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Loeflingia squarrosa var. *artemisiarum* sagebrush loeflingia	BLMS/--/2.2	Sandy flats and dunes. Sandy areas around clay flats in Great Basin scrub, Sonoran Desert scrub, and desert dunes	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Lupinus duranii Mono Lake lupine	BLMS/FSS/--/1B.2	Pumice sand flats, coarse barren soils of volcanic origin, in Great Basin scrub, subalpine coniferous forest, and upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Lupinus lepidus var. *culbertsonii* Hockett Meadows lupine	--/--/1B.3	Mesic rocky slopes in meadows, seeps, and upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Lupinus magnificus var. *hesperius* McGee Meadows lupine	BLMS/--/1B.3	Sandy substrates in Great Basin scrub and upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Lupinus magnificus var. *magnificus* Panamint Mountains lupine	BLMS/--/1B.2	Rocky and gravelly washes and banks in Great Basin scrub, Mojavean Desert scrub, and upper montane coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Mentzelia inyoensis Inyo blazing star	BLMS/--/1B.3	Rocky sites in Great Basin scrub and pinyon-juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Micromonolepis pusilla dwarf monolepis	--/--/2.3	Alkaline site in openings within Great Basin scrub.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Minuartia stricta bog sandwort	--/--/2.3	Moist, granitic gravelly sites in sedge meadows and other alpine habitats.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.

TABLE 3.3-3 (Continued)
SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State/ CNPS	General Habitat	Potential to Occur in the Project Area
Plants (cont.)			
Parnassia parviflora small-flowered grass-of-Parnassus	--/--/2.2	Rocky seeps.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Pedicularis crenulata scalloped-leaved lousewort	--/--/2.2	Near streams in wet meadows.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Penstemon cinicola ash beardtongue	--/--/4.3	Dry, rocky, igneous soils in sagebrush openings of montane forests.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Penstemon papillatus Inyo beardtongue	--/--/4.3	Rocky, granitic soils in pinyon-juniper woodland and subalpine coniferous forest.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Perityle inyoensis Inyo rock daisy	BLMS/--/1B.2	Rocky cliffs in pinyon-juniper woodland.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Phacelia gymnoclada naked-stemmed phacelia	--/--/2.3	Gravelly or clay soils in chenopod scrub, Great Basin scrub, and pinyon-juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Phacelia inyoensis Mono County phacelia	BLMS/FSS/--/1B.1	Ridgetops in alkaline mountain meadows in clay soils.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Phacelia monoensis Inyo phacelia	BLMS/FSS/--/1B.2	Alkaline meadow margins and seeps in desert scrub.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Polyctenium williamsiae Williams' combleaf	BLMS/FSS/--/1B.2	Alkali marshes, playas, and vernal pools.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Potamogeton robbinsii Robbin's pondweed	--/--/2.3	Deep water lakes.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Salix brachycarpa ssp. *brachycarpa* short-fruited willow	--/--/2.3	Edges of lakes and in wet meadows, on limestone, marble, and metamorphic substrates.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Salix nivalis snow willow	--/--/2.3	Alpine cirques.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Sedum niveum Davidson's stonecrop	--/--/3	Rocky ledges and crevices.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Sidalcea covillei Owens Valley checkerbloom	BLMS/SE/1B.1	Moist alkaline meadows and freshwater seeps, fine sandy loam soil.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Sphaeromeria potentilloides var. *nitrophila* alkali tansy-sage	--/--/2.2	Usually on alkaline soils in meadows, seeps, and playas.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.

TABLE 3.3-3 (Continued)
SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State/ CNPS	General Habitat	Potential to Occur in the Project Area
Plants (cont.)			
Streptanthus oliganthus Masonic Mountain jewel-flower	BLMS/FSS/-- /1B.2	Volcanic or decomposed granite soils, along roadsides and in old mine dumps, within pinyon-juniper woodland.	Low – Project area provides some suitable habitat. Species not observed during plant surveys.
Stuckenia filiformis slender-leaved pondweed	--/--/2.2	Shallow, clear water of lakes and drainage channels.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Trichophorum pumilum little bulrush	--/--/2.2	Wet sites on limestone soils in alpine dwarf scrub.	Unlikely – Project area is outside of species range and provides no suitable habitat. Species not observed during plant surveys.
Triglochin palustris marsh arrow-grass	--/--/2.3	Mesic sites, meadows, seeps, freshwater marsh, subalpine coniferous forest.	Unlikely – Project area provides no suitable habitat. Species not observed during plant surveys.
Natural Communities			
Mono pumice flat	--/--/--		Unlikely – Community not found in project area.
Water birch riparian scrub	--/--/--		Unlikely – Community not found in project area.

NOTE: *Species with medium or high potential to occur in the project area are shown in **bold**.

KEY:

Federal: (USFWS)
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FC = Candidate for listing by the Federal Government
BLMS = BLM Sensitive
FSS = Forest Service Sensitive

State: (CDFG)
SE = Listed as Endangered by the State of California
ST = Listed as Threatened by the State of California
SR = Listed as Rare by the State of California (plants only)
CSC = California Species of Concern

CNPS: (California Native Plant Society)
Rank 1A = Plants presumed extinct in California
Rank 1B = Plants rare, threatened, or endangered in California and elsewhere
Rank 2 = Plants rare, threatened, or endangered in California but more common elsewhere
Rank 3 = Need more information
Rank 4 = Limited distribution – a watch list
0.1 = Seriously endangered in California
0.2 = Fairly endangered in California
0.3 = Not very endangered in California
– = No Listing

SOURCE: USFWS, 2012; CDFG, 2012; CNPS, 2012; Paulus 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010

Shifts in species frequencies relative to the surrounding vegetation communities were not considered significant enough to map these potential wetland areas as separate plant communities. These areas may meet jurisdictional criteria established by the U.S. Army Corps of Engineers (USACE) and RWQCB pursuant to their Clean Water Act regulatory activities.

Resources that could be subject to general USFS goals for RCAs appear to occur only in the immediate vicinity of the existing power plants. RCAs are to be managed to preserve, enhance, and restore habitat for riparian and aquatic-dependent species, ensure that water quality is maintained or restored, enhance habitat conservation for species associated with the transition zone between upslope and riparian areas, and provide greater connectivity with watersheds (USFS, 2004). The RCA corridors mapped in the Upper Basalt and Basalt Canyon areas do not support riparian habitats or stream channels.

3.3.2 Applicable Regulations, Plans, and Policies/Management Goals

This section provides a discussion of federal, state, and regional environmental regulations, plans and standards applicable to the CD-IV Project area for vegetation resources and state and federal jurisdictional areas.

3.3.2.1 Federal

National Environmental Policy Act

NEPA (42 USC 4321 et seq.) declares a continuing federal policy that directs “a systematic, interdisciplinary approach” to planning and decision-making and requires environmental statements for “major Federal actions significantly affecting the quality of the human environment.” Implementing regulations by the Council on Environmental Quality (CEQ) (40 CFR Parts 1500-1508) require federal agencies to identify and assess reasonable alternatives to proposed actions that will restore and enhance the quality of the human environment and avoid or minimize adverse effects on the human environment (40 CFR 1500.2). Federal agencies are further directed to emphasize significant environmental issues in project planning and to integrate impact studies required by other environmental laws and Executive Orders into the NEPA process. The NEPA process should therefore be seen as an overall framework for the environmental evaluation of federal actions. The BLM is the Lead Agency under NEPA for the CD-IV Project, and the USFS is a cooperating federal agency.

Federal Endangered Species Act

The Federal Endangered Species Act (FESA) designates threatened and endangered animals and plants and provides measures for their protection and recovery. Under §7 of the FESA, a federal agency that authorizes, funds, or carries out a project that “may affect” a listed species or its critical habitat must consult with USFWS.

Clean Water Act

The federal CWA (33 USC 1251 et seq.) is intended to restore and maintain the quality and biological integrity of the nation's waters. It prohibits the discharge of pollutants into waters of the United States without a National Pollutant Discharge Elimination System (NPDES) permit from the USEPA. By issuing NPDES permits, the USEPA can regulate the discharge of pollutants to protect water quality.

Section 404 of the CWA provides that whenever any person discharges dredged or fill material into waters of the U.S. (e.g., streams, wetlands, lakes, bays) a permit is required from the USACE. The USACE has issued 50 separate Nationwide Permits (NWPs) for different types of projects with impacts to wetlands (as of March 19, 2007). Depending on the level of impact, projects qualifying for an NWP may be required to provide the USACE with Pre-Construction Notification of the impacts and meet other restrictions. Projects with greater wetland impacts than those allowed under one of the NWPs require an Individual Permit. The process of obtaining an individual permit includes public notice and response to all comments received; the permit decision document includes a discussion of the environmental impacts of the project, the permit addresses public and private needs, alternatives to achieve project purposes if needed, and beneficial and/or detrimental effects of the project on public and private uses. In SWANCC vs. USACE, the Supreme Court ruled that the jurisdiction of the USACE does not extend to isolated, intrastate, non-navigable waters and wetlands, such as vernal pools, ephemeral streams, and wetlands not associated with a stream channel. The USACE also authorizes activities that involve structures or work in or affecting navigable waters of the United States under §10 of the Rivers and Harbors Act of 1899.

Section 401 of the CWA requires that an applicant for a federal license or permit to discharge into navigable waters must provide the federal agency with a water quality certification, declaring that the discharge would comply with water quality standards requirements of the CWA. USACE issuance of a §404 permit triggers the requirement that a §401 certification also be obtained. In California, the RWQCBs issue this certification.

Executive Order 11312: Invasive Species

Executive Order 11312 directs all federal agencies to prevent and control introductions of invasive nonnative species in a cost-effective and environmentally sound manner to minimize their economic, ecological, and human health impacts. Executive Order 11312 established a national Invasive Species Council made up of federal agencies and departments and a supporting Invasive Species Advisory Committee composed of state, local and private entities. The Invasive Species Council and Advisory Committee oversee and facilitate implementation of the Executive Order, including preparation of a National Invasive Species Management Plan.

Federal Noxious Weed Act of 1974, as amended (7 USC 2801-2814)

This Act established a federal program to control the spread of noxious weeds. The Secretary of Agriculture is authorized to designate plants as noxious weeds. The movement of all such weeds in interstate or foreign commerce is prohibited except under permit.

Lacey Act, as amended (16 USC 3371-3378)

This Act protects plants and wildlife by creating civil and criminal penalties for a wide variety of violations including illegal take, possession, transport or sale of protected species.

Executive Order 11990 Protection of Wetlands

This order establishes a national policy to avoid adverse impacts on wetlands whenever there is a practicable alternative.

Fish and Wildlife Coordination Act (16 USC 661-666)

The Fish and Wildlife Coordination Act applies to any federal project where the waters of any stream or other body of water are impounded, diverted, deepened, or otherwise modified. Project proponents are required to consult with the USFWS and the appropriate state wildlife agency. These agencies prepare reports and recommendations that document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources. The term “wildlife” includes both animals and plants. Provisions of the Act are implemented through the NEPA process and Section 404 permit process.

Bureau of Land Management Sensitive Species

BLM Sensitive Species are those species that are designated by the BLM State Director for special management consideration. In California, this includes all plants that are Federal Candidates for listing, all plants that are listed as Endangered, Threatened, or Rare by the State of California, all plants that are on List 1B in the most current online version of the California Native Plant Society’s Inventory of Rare and Endangered Plants of California (unless the State Director has determined, on a case-by-case basis, that a particular List 1B plant does not require Sensitive status), and any other plants the State Director has determined to warrant Sensitive status.

BLM policies and procedures regarding the management of Special Status Plants in California are detailed in the BLM-California Handbook H-6840. It is BLM policy to manage for the conservation of Special Status Plants and their associated habitats and to ensure that actions authorized, funded, or carried out do not contribute to the need to list Sensitive Species as Threatened or Endangered.

U.S. Forest Service

The Regional Forester of the Pacific Southwest Region of the USFS is responsible for designating sensitive plant species that may be found in the Region. These species receive special protection to ensure that they do not become listed as threatened or endangered under the FESA. The Inyo National Forest maintains a subset of the Regional list that contains sensitive plant species known or suspected to occur on the forest. The Record of Decision (ROD) for the Sierra Nevada Forest Plan Amendment (SNFPA) established standards and guidelines for threatened, endangered, proposed, and sensitive (TEPS) plant species. It requires the USFS to “Conduct field surveys for TEPS plant species early enough in the project planning process that the project can be designed to conserve or enhance TEPS plants and their habitat.” In addition, the Inyo National Forest Sensitive Plant

Management Plan requires that forest activities will not disturb any sensitive plant population, or part of a sensitive plant's essential habitat, until its status is determined through a Biological Evaluation (BE). After a BE is completed, no action is to be taken that would cause a sensitive plant population to fall below the number of individuals necessary to maintain a viable population.

The SNFPA ROD also established special management objectives and standards and guidelines for identified RCAs in the Inyo National Forest (USDA, Forest Service 2004). SNFPA RCA requirements include attaining and maintaining viable populations and diversity of aquatic-dependent plant species and maintaining water flows sufficient to sustain desired habitats.

Forest Service Sensitive (FSS) species are species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that plants and animals do not become threatened or endangered and to ensure their continued viability on national forests. It is Forest Service policy to analyze impacts to sensitive species to ensure management activities do not create a significant trend toward federal listing or loss of viability.

3.3.2.2 State

California Endangered Species Act

The California Endangered Species Act (CESA) (California Fish and Game Code § 2050 *et seq.*) provides protection and prohibits the take of plant, fish, and wildlife species listed by the State of California. Unlike FESA, state listed plants have the same degree of protection as wildlife, but insects and other invertebrates may not be listed. A CESA "take" is defined similarly to a FESA "take", and is prohibited for both listed and candidate species. Take authorization may be obtained by the project applicant from CDFG under the CESA §§2091 and 2081. Section 2091, like FESA §7, provides for consultation between a state lead agency under the CEQA and CDFG, with issuance of take authorization if the project does not jeopardize the listed species. Section 2081 allows take of a listed species for educational, scientific, or management purposes. In this case, private developers consult with CDFG to develop a set of measures and standards for managing the listed species, including full mitigation for impacts, funding of implementation, and monitoring of mitigation measures.

California Environmental Quality Act

CEQA (California Public Resources Code § 21000 *et seq.*) was enacted in 1970 to provide for full disclosure of environmental impacts to the public before issuance of a permit by state and local public agencies. In addition to federal or state listed species, "sensitive" plants and animals receive consideration under CEQA. Sensitive species include, but are not limited to, wildlife Species of Special Concern listed by CDFG, and plant species on the CNPS List 1A (presumed extinct), List 1B (rare, threatened, or endangered in California and elsewhere; eligible for state listing), or List 2 (rare, threatened, or endangered in California but more common elsewhere; eligible for state listing).

California Fish and Game Code

Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code outline protection for fully protected species of mammals, birds, reptiles, amphibians, and fish. Species that are fully protected by these sections may not be taken or possessed at any time. CDFG cannot issue permits or licenses that authorize the "take" of any fully protected species, except under certain circumstances such as scientific research and live capture and relocation of such species pursuant to a permit for the protection of livestock. Furthermore, it is the responsibility of the CDFG to maintain viable populations of all native species. To that end, the CDFG has designated certain vertebrate species as Species of Special Concern because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

California Native Plant Protection Act

The Native Plant Protection Act (NPPA) (California Fish and Game Code § 1900-1913) of 1977 directed the CDFG to carry out the Legislature's intent to "preserve, protect and enhance rare and endangered plants in this State." The NPPA gave the California Fish and Game Commission the power to designate native plants as "endangered" or "rare" and protect endangered and rare plants from take. The CESA expanded on the original NPPA and enhanced legal protection for plants, but the NPPA remains part of the Fish and Game Code. To align with federal regulations, the CESA created the categories of "threatened" and "endangered" species. It converted all "rare" animals into the Act as threatened species, but did not do so for rare plants. Thus, there are three listing categories for plants in California: rare, threatened, and endangered. Because rare plants are not included in the CESA, mitigation measures for impacts to rare plants are specified in a formal agreement between CDFG and the project proponent.

Porter-Cologne Act

The intent of the Porter-Cologne Act (California Water Code § 13000 *et seq.*) is to protect water quality and the beneficial uses of water, and applies to both surface and groundwater. Under this law, the California SWRCB develops statewide water quality plans, and the RWQCBs develop basin plans that identify beneficial uses, water quality objectives, and implementation plans. The RWQCBs have the primary responsibility to implement the provisions of both statewide and basin plans. Waters regulated under Porter-Cologne include isolated waters that are no longer regulated by USACE. Developments which impact jurisdictional waters must demonstrate compliance with the goals of the Act by developing SWPPP, Standard Urban Storm Water Mitigation Plans, and other measures in order to obtain a state CWA §401 certification.

Lake and Streambed Alteration Program

Prior to commencement of any activity that would substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank (which may include associated riparian resources) of a river, stream or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake, the applicant shall submit a complete Lake or Streambed Alteration Program notification package and fee to the CDFG. The Lake and Streambed Alteration Program (California Fish and

Game Code § 1600 *et seq*.) is a California law that requires that any person, state or local government agency, or public utility notify the CDFG prior to beginning of the activities listed above. The CDFG has 30 days to review the proposed actions and propose measures to protect affected fish and wildlife resources. The final proposal that is mutually agreed upon by CDFG and the project proponent becomes the Lake or Streambed Alteration Agreement. The conditions of agreement and a CWA §404 permit often overlap.

Special-Status Natural Communities

Special-status natural communities are identified as such by the CDFG's Natural Heritage Division and include those that are naturally rare and those whose extent has been greatly diminished through changes in land use. The CNDDB tracks 135 such natural communities in the same way that it tracks occurrences of special-status species: information is maintained on each site in terms of its location, extent, habitat quality, level of disturbance, and current protection measures. The CDFG is mandated to seek the long-term perpetuation of the areas in which these communities occur. While there is no statewide law that requires protection of all special-status natural communities, CEQA requires consideration of the potential impacts of a project on biological resources of statewide or regional significance.

California Native Plant Society

The CNPS is a professional society of plant biologists, scientists and associated professionals which has accumulated a statewide database on California native plants and their distributions. The CNPS has created five categorical rankings of plants to identify their respective concern for these species as potential rare, threatened or endangered species. These listings do not afford legal status or protection for the species, but the lists are utilized by agencies in their planning processes for activities which could impact the species or habitat. Vascular plants listed as rare or endangered by the CNPS (CNPS, 2012) are defined as follows:

1. ***California Rare Plant Rank 1A*:** Plants Presumed Extinct in California.
2. ***California Rare Plant Rank 1B*:** Plants Rare, Threatened, or Endangered in California and Elsewhere.
3. ***California Rare Plant Rank 2*:** Plants Rare, Threatened, or Endangered in California, but More Common Elsewhere.
4. ***California Rare Plant Rank 3*:** Plants About Which We Need More Information – A Review List.
5. ***California Rare Plant Rank 4*:** Plants of Limited Distribution **-** A Watch List.

In general, plants appearing on CNPS Lists 1A, 1B, or 2 are considered to meet the criteria of endangered, rare, or threatened under the CEQA Guidelines Section 15380. Additionally, plants identified on CNPS Lists 1A, 1B, or 2 meet the definition of Section 1901, Chapter 10 (NPPA) and Sections 2062 and 2067 (CESA) of the California Fish and Game Code as rare or endangered species.

3.3.2.3 Local

Mono County General Plan

The Conservation/Open Space Element of the Mono County General Plan (Mono County, 1993) provides the following goals, objectives, and policies related to vegetation resources which are applicable to the Proposed Action:

> **Goal:** To maintain an abundance and variety of vegetation, aquatic and wildlife habitat types in Mono County for recreational use, natural diversity, scenic value, and economic benefits.
>
> ***Objective A*:** Maintain and restore botanical, aquatic and wildlife habitats in Mono County.
>
> *Policy 1*: Future development projects shall avoid potential significant impacts to animal or plant habitats or mitigate impacts to a level of non-significance, unless a statement of overriding considerations is made through the EIR process.
>
> *Policy 2*: Protect and restore threatened and endangered plant and animal species and their habitats.
>
> *Policy 3*: Protect and restore sensitive plants, native plants, and those species of exceptional scientific, ecological, or scenic value.
>
> *Policy 4*: Prohibit construction activities such as grading in sensitive habitats prior to environmental review in compliance with CEQA and the Mono County Grading Ordinance.

Town of Mammoth Lakes General Plan

The Resource Management and Conservation Element of the Town of Mammoth Lakes General Plan (Town of Mammoth Lakes, 2007) contains several goals and policies related to vegetation resources which are applicable to the Proposed Action:

> **Goal R.1:** Be stewards of habitat, wildlife, fisheries, forests and vegetation resources of significant biological, ecological, aesthetic and recreational value.
>
> *Policy R.1.A*: Be stewards of important wildlife and biological habitats within the Town’s municipal boundary.
>
> *Policy R.1.B*: Development shall be stewards of Special Status plant and animal species and natural communities and habitats.
>
> *Policy R.1.C*: Prior to development, projects shall identify and mitigate potential impacts to site-specific sensitive habitats, including special status plant, animal species, and mature trees.
>
> *Policy R.1.D*: Be stewards of primary wildlife habitats through public and/or private management programs.
>
> *Policy R.1.I*: Encourage the management of forest resources in and adjacent to the town to ensure forest health, minimize insect and pathogen outbreaks and reduce fuel loading.

Goal R.2: Maintain a healthy regional natural ecosystem and provide stewardship for wetlands, wet meadows and riparian areas from development-related impacts.

Policy R.2.B: Be stewards of forested areas, wetlands, streams, significant slopes and rock outcroppings. Allow stands of trees to continue to penetrate the community to retain the mountain character of Mammoth Lakes. Minimize tree removal for development to the greatest extent possible.

Policy R.2.C: Avoid wetland disturbance to greatest extent possible by requiring all feasible project modifications.

Policy R.2.D: Mapped intermittent streams should not be placed in culverts.

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3.4 Biological Resources – Wildlife

This section describes the environmental setting, wildlife habitats, and special status wildlife species that are present or have the potential to occur on the CD-IV Project site. It also discusses the regulatory framework associated with wildlife resources that may be present at the Project site.

This discussion is based, in part, upon information from these sources:

1. Final Biological Evaluation for Casa Diablo IV (CD-IV) Geothermal Development Project (AMEC E&I, Inc., 2012);

2. Draft Project Management Indicator Species Report, Casa Diablo IV Geothermal Development Project (MACTEC Engineering and Consulting, 2010);

3. Deer Track-Count Survey Results, Geothermal Expansion Project, Mammoth Lakes, CA (MACTEC Engineering and Consulting, 2011);

4. Fall 2011 Resident Deer Survey for the Casa Diablo, Basalt Canyon, and Upper Basalt Geothermal Areas (Paulus, 2011);

5. Fall 2011 Migratory Deer Survey for the M-1 Project Site at the Casa Diablo Geothermal Area (Paulus, 2012a);

6. Fall 2011 Migratory Deer Survey for the Casa Diablo, Basalt Canyon, and Upper Basalt Geothermal Areas (Paulus, 2012b);

7. Biological Assessment for the Basalt Canyon Geothermal Pipeline Project (Environmental Management Associates, Inc., 2005);

8. Focused botanical surveys performed in 2008, 2009, and 2010 (Paulus 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010); and

9. The California Natural Diversity Database (CNDDB) (CDFG, 2012).

The Project area for wildlife resources includes National Forest System lands administered by Inyo National Forest. The Project area where wildlife habitats were characterized and special-status wildlife habitat assessments were performed included the immediate footprint for the geothermal power plant site(s), the geothermal well sites, and a 300-foot wide survey corridor for pipeline routes. The entirety of the project site and Project area supports a variety of wildlife species that use the natural plant communities described in Section 3.3, *Biological Resources – Vegetation*.

3.4.1 Environmental Setting

3.4.1.1 Regional Setting

The CD-IV Project is located in an ecologically diverse transition zone between the lower elevations of the eastern slope of the Sierra Nevada on the west and the Great Basin on the east. The climate at these elevations is montane, with temperatures ranging from temperate to cold, and arid to low humidity. The montane climate is influenced by a rain shadow effect due to the close proximity of the steep eastern escarpment of the Sierra Nevada Mountains to the west. Average annual precipitation in the vicinity of the CD-IV Project is 23.2 inches, and average annual snowfall is 209.6 inches. The xeric summer months are irregularly interrupted by heavy rains from thunderstorms. Mean maximum temperature is approximately 56.5° F and mean minimum temperature is approximately 28.8° F (WRCC, 2012).

3.4.1.2 Project Setting

The CD-IV power plant would be located in Sections 29 and 32, Township 3 South, and Range 28 East MD B&M. This location is east of U.S. Highway 395 and approximately ½-mile to the northwest of the three existing geothermal power plants, which are about two miles east of the Town of Mammoth Lakes in Mono County, California. The CD-IV Project's geothermal resource wells and pipelines would be located within the Inyo National Forest in Section 25, 26, and 36 of T3S, R27E and Sections 30, 31 and 32 of T3S, R28E, MD B&M. The majority of the Project area is undeveloped, with scattered unimproved roads traversing the area.

Within the Project area, terrain is variable between nearly level to gently rolling slopes with scattered steeper slopes. Elevations range from approximately 7,880 feet at the highest proposed well pad site in the northwest portion of the Project area and 7,200 feet at the lowest proposed well pad site in the southeast of the Project area. Drainage is generally to the southeast. Natural unnamed ephemeral channels drain the Project area, eventually flowing to Mammoth Creek south of the CD-IV Project site.

3.4.1.3 General Wildlife and Habitats

Project area vegetation communities are described in Section 3.1.3. Vegetation communities were identified in previous technical reports (Paulus 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010). Each of these reports was reviewed by ESA biologists prior to their reconnaissance survey. These vegetation communities can be generally correlated to habitats for wildlife. The wildlife habitats identified in this section were categorized using the CDFG's *A Guide to Wildlife Habitats* (Mayer and Laudenslayer, 1988) and the associated vegetative communities were categorized and described using *A Manual of California Vegetation, 2nd Edition* (Sawyer et al., 2009).

Wildlife habitats within the Project area include Jeffrey pine forest, pinyon-juniper woodland, sagebrush scrub, and barren (thermally disturbed and mechanically disturbed). The Project area consists primarily of Great Basin Mixed Scrub habitat in the lower elevations and Jeffrey Pine Forest habitat in the higher elevations. The boundary between these two habitat types is often indistinct and very broad within the Project area. Increasing elements of Great Basin Mixed Scrub occur at the edge of the Jeffrey Pine Forest. Understory vegetation density and diversity within the Jeffrey Pine Forest community is related to tree canopy cover. Typical understory vegetation within the Project area includes components of Great Basin Mixed Scrub community and some sparse native perennial grasses.

There are no perennial streams or other surface waters located within the Project area, nor are there any springs, seeps or wet swales, which would provide habitat for riparian or aquatic wildlife. The two drainage systems which have each been identified as ephemeral/intermittent RCAs by the USFS within the Project area do not support any riparian vegetation and do not provide any habitat for riparian or aquatic wildlife.

In part because it is close to the Town of Mammoth Lakes, the Project area has been affected by a substantial number of human activities. These include construction of highways, roads, transmission lines, power plants, and recreational facilities, as well as forest thinning. Although habitat in the Project area retains much of its natural character, these human activities affect both the quality of the wildlife habitat and the ability of the wildlife to use this habitat.

Wildlife species observed in the Project area during surveys include mule deer (*Odocoileus hemionus*), jackrabbits (*Lepus* sp.), cottontail rabbits (*Sylvilagus* sp.), ground squirrels (*Spermophilus* sp.), chipmunks (*Neotamias* sp.), kangaroo rats (*Dipodomys* sp.) and wood rats (*Neotoma* sp.). Bird species included black-billed magpie (*Pica hudsonia*), gray flycatcher (*Empidonax wrightii*), pinyon jay (*Gymnorhinus cyanocephalus*), sage thrasher (*Oreoscoptes montanus*), sparrows and hawks.

3.4.1.4 Special Status Animal Species

Special-status animal species are legally protected under the FESA, CESA, and other regulations. These species fall into in the following categories:

1. Animals listed or proposed for listing as threatened or endangered under the FESA (50 Code of Federal regulations [CFR] 17.12 [listed plants], 17.11 [listed animals] and various notices in the Federal Register [FR] [proposed species]).
2. Animals that are candidates for possible future listing as threatened or endangered under the FESA (61 FR 40, February 28, 1996);
3. Animals listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 California Code of Regulations [CCR] 670.5);
4. Animals that meet the definitions of rare and endangered under CEQA. CEQA Section 15380 provides that a plant or animal species may be treated as “rare or endangered” even if not on one of the official lists (State CEQA Guidelines, Section 15380);
5. Animals designated as Sensitive by the BLM;
6. Animals designated as Sensitive by the USFS; and
7. Animals designated as Species of Special Interest by the USFS.

A list of special-status animal species that have the potential to occur within the vicinity of the Project area was compiled based on data in CNDDB (CDFG, 2012) (Figure 3.4-1) and the USFWS List of Federal Endangered and Threatened Species that may be Affected by Projects in Mono County, CA (USFWS, 2012b). The USFWS List of Federal Endangered and Threatened Species that may be Affected by Projects in Old Mammoth, California quadrangle was also reviewed (USFWS, 2012a). Conclusions regarding habitat suitability and species occurrence are based on reconnaissance surveys conducted by ESA in 2010, analysis of existing literature and databases described previously, and various studies of biological resources conducted in the Project area (Paulus 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010; 2012; AMEC E&I, Inc., 2012; MACTEC, 2010). Focused biological surveys for special-status wildlife species were not conducted for this Project.

Table 3.4-1 lists special-status animal species with the potential to occur within the Project area. The “Potential to Occur in the Project Area” category is defined as follows:

1. ***Unlikely*****:** The project site and/or immediate area do not support suitable habitat for a particular species. The project site is outside of the species known range.

2. ***Low Potential*****:** The project site and/or immediate area only provide limited habitat for a particular species. In addition, the known range for a particular species may be outside of the immediate Project area.

3. ***Moderate Potential*****:** The project site and/or immediate area provide suitable habitat for a particular species, and habitat for the species may be impacted.

4. ***High Potential*****:** The project site and/or immediate area provide ideal habitat conditions for a particular species and/or known populations occur in immediate area or within the potential area of impact.

Special-status species with a medium to high potential to occur at the Project area are discussed in detail below.

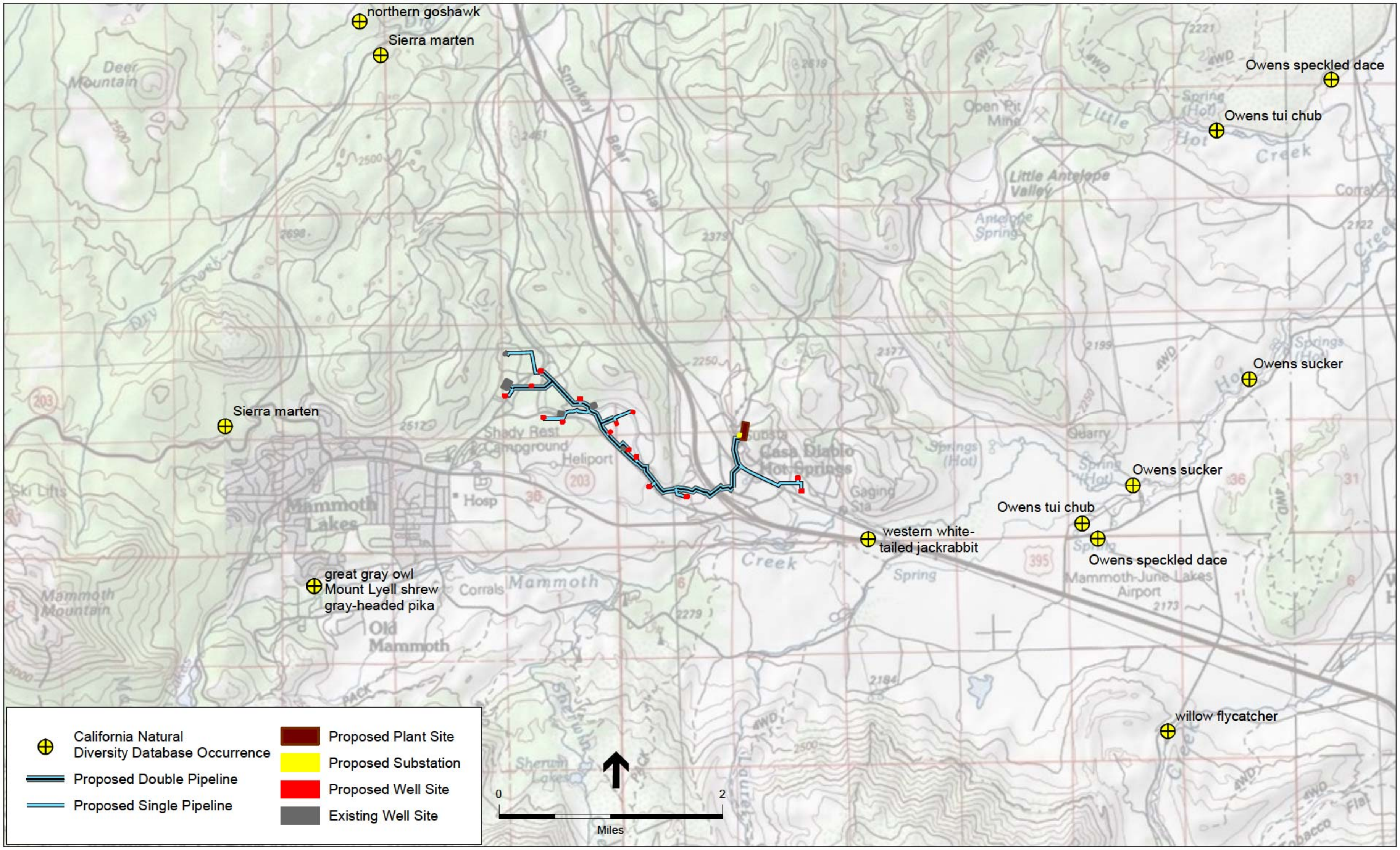
Owens sucker (Catostomus fumeiventris)

Status: Owens sucker is a California Species of Special Concern.

Distribution: The Owens sucker is endemic to the Owens River drainage and is distributed widely throughout the Owens Valley. It is most abundant in Crowley Reservoir in Mono County. Other populations exist in Convict Lake and June Lake in Mono County.

Habitat and Biology: Owens suckers are most abundant in river and stream sections with long runs and few riffles which have beds consisting mostly of fine material, with lesser amounts of gravel and rubble. Adults can thrive in lakes and reservoirs, but presumably need gravelly riffles in tributary streams for spawning.

Status in Project Site: There is no available habitat at the project site. However, suitable habitat for this species exists downstream of the project area in Mammoth Creek and this habitat may be affected indirectly by the project.



SOURCE: Ormat, 2011; CDFG, 2012

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.4-1
Special Status Animals in the Project Vicinity

TABLE 3.4-1
SPECIAL-STATUS ANIMAL SPECIES POTENTIALLY OCCURRING IN THE PROJECT AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Fish			
Catostomus fumeiventris Owens sucker	--/SSC	Endemic to the Owens River drainage. In its native river habitat it is most common in areas with long runs and few riffles. Adults can thrive in reservoirs, but need gravelly riffles in tributary streams for spawning.	Moderate – Project area does not provide suitable habitat. However, suitable, occupied habitat for this species exists downstream of the project area in Mammoth Creek.
Cyprinodon radiosus Owens pupfish	FE/SE	Shallow water habitats in the Owens Valley. Prefers warm, clear, shallow water free of exotic fishes. Needs areas of firm substrate for spawning.	Unlikely –Project area does not provide suitable habitat, and project area is outside of species range.
Oncorhynchus clarkii henshawi Lahontan cutthroat trout	FT/--	Historically in all accessible cold waters of the Lahontan Basin in a wide variety of water temperatures and conditions. Cannot tolerate the presence of other salmonids. Requires gravel riffles in streams for spawning.	Unlikely – Project area is outside of species range.
Oncorhynchus clarkii seleniris Paiute cutthroat trout	FT/--	Needs cool, well oxygenated waters. Cannot tolerate the presence of other salmonids. Requires clean gravel for spawning.	Unlikely – Project area is outside of species range.
Oncorhynchus mykiss aguabonita California golden trout	FSS/SSC	Native to Kern Plateau in wide, shallow and exposed streams with little riparian vegetation. Transplanted to other waters. Stream bottoms of sand, gravel and some cobble. Water is clear and usually cold, but summer temperatures can vary from 3 to 22 C.	Unlikely – Project area is outside of species range.
Rhinichthys osculus ssp. 2 Owens speckled dace	--/SSC	Small streams and springs in Owens River drainage. Occupies a variety of habitats. Rarely found in water greater than 29 degrees C.	Unlikely – Project area does not provide suitable habitat, and project area is outside of species range.
Siphateles bicolor snyderi Owens tui chub	FE/SC	Endemic to the Owens River Basin in a variety of habitats. Needs clear, clean water, adequate cover, and aquatic vegetation.	Moderate – Project area does not provide suitable habitat. However, suitable, occupied habitat for this species exists downstream of the project area near the Hot Creek State Fish Hatchery and at the Little Hot Creek area.
Invertebrates			
Hygrotus fontinalis travertine band-thigh diving beetle	--/--	Aquatic. Occurs in the run-off pools from hot springs in a limestone outcrop.	Unlikely – Project area does not provide suitable habitat.
Pyrgulopsis owensensis Owen's Valley springsnail	FSS/--	Found along escarpments of White and Inyo Mountains on the east side of the Owens Valley. Lives in small springbrooks where snails are typically common in watercress and/or on bits of travertine and stone.	Unlikely – Project area is outside of species range and provides no suitable habitat.
Pyrgulopsis wongi Wong's springsnail	FSS/--	Owens Valley. Along east side from Pine Creek to Little Lake and along west side from French Springs to Marble Creek. Seeps and small-moderate size spring-fed streams. Common in watercress and/or on small bits of travertine and stone.	Unlikely – Project area is outside of species range and provides no suitable habitat.

TABLE 3.4-1 (Continued)
SPECIAL-STATUS ANIMAL SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Amphibians			
Anaxyrus canorus Yosemite toad	FC/SSC	Primarily montane wet meadows; also in seasonal ponds associated with lodgepole pine and subalpine conifer forest.	Unlikely – Project area does not provide suitable habitat.
Batrachoseps campi Inyo Mountain slender salamander	FSS/SSC	Moist canyons on the west and east slopes of the Inyo Mountains, where surface water is present. Takes cover under rocks on moist sandy loam in steep-walled canyons with permanent springs. Also in underground crevices.	Unlikely – Project area is outside of species range and provides no suitable habitat.
Batrachoseps robustus Kern Plateau slender salamander	FSS/--	Found in moist habitats of pine and fir forests, and pinyon pine, sagebrush, and oaks in drier habitats. Found under logs, bark, rocks and other debris especially near springs, seeps, and outflow streams.	Unlikely – Project area is outside of species range.
Lithobates pipiens northern leopard frog	FSS/SSC	Native range is east of Sierra Nevada-Cascade crest. Near permanent or semi-permanent water in a variety of habitats. Highly aquatic species. Shoreline cover, submerged and emergent aquatic vegetation are important habitat considerations.	Unlikely – Project area does not provide suitable habitat.
Rana muscosa Mountain yellow-legged frog	FE/SC	Federal listing refers to populations in the San Gabriel, San Jacinto, and San Bernardino Mountains only. Always encountered within a few feet of water. Tadpoles may require 2-4 years to complete their aquatic development.	Unlikely – Project area does not provide suitable habitat.
Rana sierrae Sierra Nevada yellow-legged frog	FC/SC	Always encountered within a few feet of water. Tadpoles may require 2-4 years to complete their aquatic development.	Unlikely – Project area does not provide suitable habitat.
Reptiles			
Elgaria panamintina Panamint alligator lizard	FSS/SSC	Found in the White and Inyo Mountains to the north and west, and the Panamint Mountains to the south and east. Inhabits areas near permanent water, in canyons, damp gullies, and rocky areas near dense vegetation.	Unlikely – Project area is outside of species range and provides no suitable habitat.
Birds			
Accipiter gentilis Northern goshawk	FSS/SSC	Within and in vicinity of coniferous forest. Uses old nests and maintains alternate sites. Usually nests on north slopes, near water. Red fir, lodgepole pine, Jeffrey pine, and aspens are typical nest trees.	High – Suitable habitat exists in the Project area and is within species known range. Known nesting sites and Protected Activity Centers (PACs) located within the Project area.
Aquila chrysaetos Golden eagle	FSS/BLMS/CFP	Inhabits rolling foothills, mountain areas, and deserts, with open areas for hunting. Often nest in rugged, open habitats with canyons and escarpments, with overhanging ledges and cliffs and large trees used as cover.	Unlikely – No nesting locations are documented in the regional Project area, and the Project area provides no foraging or nesting habitat.

TABLE 3.4-1 (Continued)
SPECIAL-STATUS ANIMAL SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Birds (cont.)			
Buteo swainsoni Swainson's hawk	FSS/CT	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	Unlikely – Project area is outside of species range and provides no suitable habitat.
Centrocercus urophasianus greater sage-grouse	FC/BLMS/FSS/ MIS/SSC	Restricted to flat/rolling terrain vegetated by sage brush, upon which it depends for both food and shelter.	Moderate – Marginal habitat exists in the Project area and is within species known range. Known occurrence from just south of Project area.
Charadrius alexandrinus nivosus western snowy plover	FT/SSC	Sandy beaches, salt pond levees, and shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	Unlikely – Project area does not provide suitable habitat.
Coccyzus americanus occidentalis western yellow-billed cuckoo	FC/FSS/SE	Riparian forest nester. Along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	Unlikely – Project area does not provide suitable habitat.
Empidonax traillii willow flycatcher	FSS/SE	Inhabits extensive thickets of low, dense willows on edge of wet meadows, ponds, or backwaters. Requires dense willow thickets for nesting/roosting. Low, exposed branches are used for singing posts/hunting perches.	Unlikely – Project area does not provide suitable habitat.
Empidonax traillii extimus southwestern willow flycatcher	FE/SE	Riparian woodlands in southern California.	Unlikely – Project area does not provide suitable habitat.
Falco mexicanus prairie falcon	--/--	Inhabits dry, open terrain, either level or hilly.	Low – Project area provides poor quality suitable habitat.
Haliaeetus leucocephalus bald eagle	FD/FSS/SE	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within one mile of water. Nests in large, old-growth, or dominant live trees with open branches, especially ponderosa pine. Roosts communally in winter.	Low – Project area provides poor quality suitable habitat. There is no suitable foraging habitat in the project area.
Riparia riparia bank swallow	--/ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, and ocean to dig nesting hole.	Unlikely – Project area does not provide suitable habitat.
Strix nebulosa great gray owl	FSS/SE	Resident of dense mixed conifer or red fir forest habitat, in or on edge of meadows. Requires large diameter snags in a forest with high canopy closure, which provide a cool sub-canopy microclimate.	Unlikely – Project area does not provide suitable habitat.

TABLE 3.4-1 (Continued)
SPECIAL-STATUS ANIMAL SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Birds (cont.)			
Strix occidentalis California spotted owl	FSS/MIS/SSC	Associated with conifer forests in California at elevations ranging from sea level to approximately 7,500 feet. They utilize a variety of forest stand structures for nesting, roosting, and foraging behavior. Typically, nesting habitat is within multilayered canopies of greater than 50% canopy closure, usually within the vicinity of ponds.	Unlikely – Project area does not provide suitable habitat.
Toxostoma lecontei Le Conte's thrasher	BLMS/SSC	Desert resident, primarily of open desert wash, desert scrub, alkali desert scrub, and desert succulent scrub habitats. Commonly nests in a dense, spiny shrub or densely branched cactus in desert wash habitat, usually 2-8 feet above ground.	Unlikely – Project area does not provide suitable habitat.
Vireo bellii pusillus Least Bell's vireo	FE/SE	Summer resident of southern California in low riparian in vicinity of water or in dry river bottoms. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, coyote brush, and mesquite.	Unlikely – Project area does not provide suitable habitat.
Mammals			
Aplodontia rufa californica Sierra Nevada mountain beaver	--/SSC	Dense growth of small deciduous trees and shrubs, wet soil, and abundance of forbs in the Sierra Nevada and east slope. Needs dense understory for food and cover. Burrows into soft soil. Needs abundant supply of water.	Unlikely – Project area provides no suitable habitat.
Antrozous pallidus pallid bat	BLMS/FSS/SSC	Deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	Medium – Project area provides suitable foraging and limited roosting habitat. The ongoing use of the project area for recreational uses likely precludes the use of the area for roosting.
Corynorhinus townsendii Townsend's big-eared bat	FSS/SSC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	Medium – Project area provides suitable foraging and limited roosting habitat. The ongoing use of the project area for recreational uses likely precludes the use of the area for roosting.
Gulo gulo California wolverine	FC/ST/CFP	Found in the north Coast Mountains and the Sierra Nevada. Found in a wide variety of high elevation habitats. Needs water source. Uses caves, logs, burrows for cover and den area. Hunts in more open areas. Can travel long distances.	Low – Project area provides poor quality suitable habitat. The presence of a populated area near the project area likely precludes the use of the area by wolverine.
Lasionycteris noctivagans silver-haried bat	--/--	Primarily a coastal and montane forest dweller feeding over streams, ponds, and open brushy areas. Roosts in hollow trees, beneath exfoliating bark, abandoned woodpecker holes, and rarely under rocks.	Low – Project area provides poor quality suitable habitat.

TABLE 3.4-1 (Continued)
SPECIAL-STATUS ANIMAL SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Mammals (cont.)			
Lasiurus blossevillii *western red bat*	FSS/SSC	Roosts primarily in trees, 2-40 feet above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.	Low – Project area provides poor quality suitable habitat.
Lepus townsendii townsendii western white-tailed jackrabbit	--/SSC	Sagebrush, subalpine conifer, juniper, alpine dwarf shrub, and perennial grassland. Open areas with scattered shrubs and exposed flat-topped hills with open stands of trees. Brush and herbaceous understory.	High – Suitable habitat exists in the project area and is within species known range. Known occurrence from just east of Project area.
Martes americana sierrae Sierra marten	FSS/MIS	Mixed evergreen forests with more than 40% crown closure along Sierra Nevada and Cascade Mountains. Needs variety of different-aged stands, particularly old-growth conifers and snags which provide cavities for nesting.	Medium – Project area provides suitable foraging and limited nesting habitat.
Martes pennanti (pacifica) DPS Pacific Fisher	FC/SSC	Intermediate to large-tree stages of coniferous forests and deciduous-riparian areas with high percent canopy closure. Uses cavities, snags, logs and rocky areas for cover and denning. Needs large areas of mature, dense forest.	Low – Project area provides poor quality suitable habitat.
Myotis evotis long-eared myotis	--/--	Found in all brush, woodland, and forest habitats from sea level to about 9,000 feet. Prefers coniferous woodlands and forests. Nursery colonies in buildings, crevices, spaces under bark, and snags. Caves used primarily as night roosts.	Low – Project area provides poor quality suitable habitat.
Myotis volans long-legged myotis	--/--	Most common in woodland and forest habitats above 4,000 feet. Trees are important day roosts; caves and mines are night roosts. Nursery colonies usually under bark or in hollow trees, but occasionally in crevices or buildings.	Low – Project area provides poor quality suitable habitat.
Myotis yumaensis Yuma myotis	--/--	Optimal habitats are open forests and woodlands with sources of water over which to feed. Distribution is closely tied to bodies of water. Maternity colonies in caves, mines, buildings, or crevices.	Low – Project area provides poor quality suitable habitat.
Ochotona princeps schisteceps gray-headed pika	--/--	Mountainous areas, generally at higher elevations, often above the treeline up to the limit of vegetation. At lower elevations found in rocky areas within forests or near lakes. Talus slopes, occasionally mine tailings. Prefers talus-meadow interface.	Unlikely – Project area provides no suitable habitat.
Odocoileus hemionus mule deer	SSI/--	Mule deer range and habitat includes coniferous forest, foothill woodland, shrubland, grassland, agricultural fields, and suburban environments.	High – Suitable habitat exists in the Project area and is within species known range. Species has been observed in the Project area.

TABLE 3.4-1 (Continued)
SPECIAL-STATUS ANIMAL SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Mammals (cont.)			
Ovis canadensis sierrae Sierra Nevada bighorn sheep	FE/SE/CFP	Historically found along the east side and crest of the Sierra Nevada, and on the Great Western Divide. Available water and steep, open terrain free of competition from other grazing ungulates.	Unlikely – Project area provides no suitable habitat.
Sorex lyelli Mount Lyell shrew	--/SSC	High elevation riparian areas in the southern Sierra Nevada. Requires moist soil. Lives in grass or under willows. Uses logs, stumps, etc. for cover.	Unlikely – Project area provides no suitable habitat.
Vulpes vulpes necator Sierra Nevada red fox	FSS/ST	Found from the Cascades down to the Sierra Nevada. Found in a variety of habitats from wet meadows to forested areas. Use dense vegetation and rocky areas for cover and den sites. Prefer forests interspersed with meadow or alpine fell-fields.	Medium – Project area provides suitable foraging and limited denning habitat.

NOTE: *Species with medium or high potential to occur in the project area are shown in **bold**.

KEY:

Federal: (USFWS)
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FC = Candidate for listing by the Federal Government
BLM S= BLM Sensitive
FSS = Forest Service Sensitive
MIS = Forest Service Management Indicator Species
SSI = Forest Service Species of Special Interest

State: (CDFG)
SE = Listed as Endangered by the State of California
ST = Listed as Threatened by the State of California
SR = Listed as Rare by the State of California (plants only)
SSC = California Species of Special Concern

CNPS: (California Native Plant Society)
Rank 1A = Plants presumed extinct in California
Rank 1B = Plants rare, threatened, or endangered in California and elsewhere
Rank 2 = Plants rare, threatened, or endangered in California but more common elsewhere
Rank 3 = Need more information
0.1 = Seriously endangered in California
0.2 = Fairly endangered in California
0.3 = Not very endangered in California
– = No Listing

SOURCE: USFWS, 2012; CDFG, 2012; CNPS, 2012; MACTEC, 2010a; 2010b

Owens tui chub (Siphateles bicolor snyderi)

Status: Owens tui chub is listed as Endangered under both the FESA and CESA.

Distribution: The Owens tui chub is a subspecies of several cyprinids found throughout the Great Basin and Pacific Ocean drainages. The Owens tui chub was historically a wide-spread and abundant native fish species in the Owens River drainage. However, its range has been reduced as a result of the loss of its spring and edge-water habitat through development, channelization, and water diversions. Habitat degradation also has resulted from the introduction of both game fish and the non-native Lahontan tui chub.

Habitat and Biology: The remaining genetically pure Owens tui chub populations only exist in habitats that are isolated from non–native fish. Isolation is necessary to protect the Owens tui chub from predatory fish such as largemouth bass and brown trout. It is also necessary to prevent interbreeding and hybridization of the Owens tui chub with another subspecies, the Lahontan tui chub (Chen and May, 2003). Important habitat requirements for the Owens tui chub are high quality and low velocity water. Also required are adequate cover, in the form of rocks, undercut banks, or dense aquatic vegetation, and a sufficient insect food base. The USFWS Recovery Plan for the species also suggests that the water should be cool. Owens tui chub appear to be tolerant of a wide range of water temperatures. However, substantial changes in water temperature could adversely affect Owens tui chub habitat and could threaten the viability of Owens tui chub populations.

Status in Project Site: There is no Owens tui chub habitat available are the Project site. Native Owens tui chub populations occur in the "warm water" (mixed cold and thermal) AB springs and the CD springs of the Hot Creek State Fish Hatchery located approximately 2 miles east of the Project site. These springs have been designated by the USFWS as critical habitat for the Owens tui chub. A second population occurs in the uppermost reach of the Owens River Gorge (Upper Owens Gorge). Transplants from the CD springs and Upper Owens Gorge were transferred to the former Owens Valley Native Fishes Sanctuary in Fish Slough, and progeny of these transplants exist in a waterfowl impoundment on USFS land in Little Hot Creek. Spring flow in Little Hot Creek may be tied to ground water pumping disturbance. Other remnant populations were reported to occur on lands owned by the LADWP, Cabin Bar Ranch, Mule Spring, and Sotcher Lake (Chen and May, 2003).

Golden eagle (Aquila chrysaetos)

Status: The golden eagle is a Forest Service Sensitive and BLM Sensitive species, and is Fully Protected by CDFG.

Distribution: Golden eagles are typically year-round residents throughout most of their western United States range.

Habitat and Biology: Golden eagles generally breed from late January through August with peak activity March through July (Kochert et al., 2002). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall. This species is generally considered to be more common in southern California than in the northern part of the state (U.S. Forest Service [USFS], 2008).

Habitats for this species typically include rolling foothills, mountain areas, and deserts. Golden eagles need open terrain for hunting and prefer grasslands, deserts, savanna, and early successional stages of forest and shrub habitats. Golden eagles primarily prey on lagomorphs and rodents but will also take other mammals, birds, reptiles, and some carrion (Kochert et al., 2002). This species prefers to nest in rugged, open habitats with canyons and escarpments, with overhanging ledges and cliffs and large trees used as cover.

Status in Project Site: The secondary growth Jeffery pine forest in the Project site does not provide nesting opportunities for golden eagles, and foraging habitat is considered marginal in low density scrub areas. Golden eagles are considered unlikely in the Project area because habitat is not appropriate for this species.

Northern Goshawk (Accipiter gentilis)

Status: The northern goshawk is a California Species of Special Concern and a USFS Sensitive species.

Distribution: The northern goshawk is a widespread species that inhabits the temperate parts of the northern hemisphere. It breeds in coniferous forest habitats throughout the mountainous areas of California. Within the Sierra Nevada, northern goshawks breed from approximately 2,500 feet in ponderosa pine vegetation type through approximately 9,000 feet in the red fir and lodgepole pine vegetation types, and throughout eastside pine forests on the east slope.

Habitat and Biology: Northern goshawks are typically associated with late seral or old growth forests, characterized by contiguous stands of large diameter trees (greater than 24 inches diameter at breast height [dbh]) and large snags with closed canopies (greater than 40 percent) and an understory which contains varying vertical structure but is not over crowded with “dog-hair” thickets of trees or other vegetation types. Stick nests are often built in trees on north or northwest facing slopes of less than 30 percent and near water. Large aspens or conifers within a stream corridor are often selected as nest trees.

Status in Project Site: The Jeffrey pine stands in the western portion of the Project site around Shady Rest Park are suitable northern goshawk nesting and foraging habitat. Northern goshawk “protected activity centers” (PACs) have been established by the USFS under the SNFPA within these portions of the Project site. Proposed well sites 14-25, 15-25, 25-25 and 34-25 are within a northern goshawk PAC, while proposed well site 77-25 is adjacent to the PAC. Five known northern goshawk nest sites have been identified in this portion of the Project site that are believed to be associated with one pair of goshawks which return seasonally.

Greater sage-grouse (Centrocercus urophasianus)

Status: The greater sage-grouse is a Candidate for listing under the FESA, a California Species of Special Concern, a BLM Sensitive species, a USFS Sensitive species, and a USFS Management

Indicator Species. The USFWS has determined that greater sage-grouse in a portion of California and Nevada known as the Bi-State area, which includes the project area, are a distinct population segment (DPS). The USFWS is considering the Bi-State DPS separately from other greater sage-grouse populations for listing under the FESA.

Distribution: Sage-grouse are found on the sage-steppe habitats from southern Saskatchewan to southern Colorado and west to California, primarily in areas dominated by sagebrush (*Artemesia* spp.), forbs, and grasses. Sage-grouse are locally common in the sagebrush steppe of eastern California and locally along the toe of the eastern Sierra slope from Mammoth Lakes south and east. The Bi-State DPS, a genetically unique metapopulation, occurs over an area about 170 miles long and up to 60 miles wide that includes portions of five counties in western Nevada and three in eastern California. Two core populations are in Mono County, one of which is in Long Valley. The project area is within the South Mono Management Unit (MA) of the Bi-State DPS area, as delineated in the Bi-State Sage-Grouse DPS Action Plan (Bi-State TAC, 2012).

Habitat and Biology: Sage-grouse are dependent upon sagebrush ecosystems year-round and in all stages of their life cycle, and require a variety of microhabitats within that ecosystem. Sagebrush, forbs, and insects are important foods. Leks (mating sites) are in areas of low and/or sparse vegetation; most mating occurs March-May in Long Valley, with nesting and brood rearing through July. In the Bi-State area, 95 percent of nest sites are within 3.2 miles of leks (Coates et al., 2012). Nest sites have been found to be characterized by a higher percent shrub cover than in other parts of the species' range; and, also in contrast to other regions, understory vegetation was not an important factor in nest site selection, and nest survival increased with increasing cover of shrubs other than sagebrush (Kolada et al. 2009). Females with broods selected areas with more perennial forbs and higher plant species richness, and avoided areas encroached by juniper and pinyon; the probability of fledging a brood increased as females selected habitats with greater densities of perennial forbs and more meadow edge (Casazza et al. 2011).

Status in Project Site: The Project site contains suitable habitat for sage-grouse with sagebrush, perennial grasses and bitterbrush being the predominant vegetation. The potential sage-grouse habitat is of marginal quality due to the low density of the sagebrush, the presence of interspersed Jeffrey pines and the lack of herbaceous cover. Grouse have been seen within a 0.25-mile distance from the Project site’s southern edge.

Pallid Bat (Antrozous pallidus)

Status: The pallid bat is a California Species of Special Concern, a BLM Sensitive species, and a USFS Sensitive species.

Distribution: The pallid bat is widely distributed across west and southwestern United States, and north to eastern Oregon and Washington. They are also found in south-central British Columbia, Mexico, and Cuba. Population trends are not well known, but there are indications of decline.

Habitat and Biology: Pallid bats are found in arid desert habitats, often near rocky outcrops with the presence of water. They may also be found in ponderosa pine forests near cliff faces associated with water. This bat prefers to forage in open areas and may be found over sparsely vegetated sagebrush and grasslands frequenting gravel roads and canyon mouths. Ponderosa pines are preferred as night roosts and steep cliffs are utilized as day roosts. Crevices in rock cliffs and buildings are most commonly used as day roosts. This species hibernates in the winter, as individuals or in small groups, utilizing buildings, rock crevices, mine tunnels and caves.

Status in Project Site: The key components of habitat for the pallid bat consist of open foraging opportunities in combination with suitable roost areas in association with water. Suitable foraging habitat exists across the Project site and suitable roosting habitat exists within the Jeffery pine forest along the northern boundary of the Project site. The species is thought to be present in the vicinity of the Project site based on habitat suitability.

Townsend's big-eared bat (Corynorhinus townsendii)

Status: Townsend's big-eared bat is a California Species of Special Concern and a USFS Sensitive species.

Distribution: Townsend's big-eared bats have been reported in a wide variety of habitat types including coniferous forests, mixed mesophytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat, ranging from sea level to 3,300 meters. Their most typical habitat is arid western desert scrub and pine forest regions.

Habitat and Biology: Townsend's big-eared bats occur throughout the west with their distribution strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines.

Status in Project Site: The open nature of the Project site would constitute suitable foraging habitat for this species. Suitable roosting habitat in the forms of caves or mine shafts, while not specifically on the Project site, are found in the Mammoth Mountain and Rhyolite Ridge areas approximately five miles to the southwest. These caves and shafts are not known to be occupied.

Western white-tailed jackrabbit (Lepus townsendii townsendii)

Status: The western white-tailed jackrabbit is a California Species of Special Concern.

Distribution: Western white-tailed jackrabbits are year-round residents of the crest and upper eastern slope of the Sierra Nevada, primarily from the Oregon border south to Tulare and Inyo counties. Formerly widespread throughout this range, its population now is fragmented, and numbers apparently have declined drastically.

Habitat and Biology: Western white-tailed jackrabbits are thought to inhabit a variety of montane habitats in the Eastern Sierra Nevada, most commonly those having a significant shrub component. Preferred habitats are sagebrush, subalpine conifer, juniper, alpine dwarf-shrub, and perennial grassland. This species also uses low sagebrush, wet meadow, and early successional stages of various conifer habitats. They are mainly nocturnal when foraging.

Status in Project Site: This species could potentially use the scrub habitats in the Project site for burrowing and foraging.

Sierra marten (Martes americana sierrae)

Status: Sierra marten is a USFS Sensitive species and a USFS Management Indicator Species.

Distribution: In California, marten occur in the northern Sierra Nevada at elevations of 3,400 feet to 10,400 feet, averaging 6,600 feet. For the southern Sierra Nevada, the elevational range is from 4,000 feet to 13,100 feet, averaging 8,300 feet. Marten are known to exist in suitable habitat throughout the Sierra Nevada.

Habitat and Biology: This species is found in montane coniferous forest communities in northern California. It utilizes a number of conifer-dominated habitats including red fir and lodgepole pine forests. American martens are found associated with conifer stands of varying canopy closures. Such habitats provide large trees, snags, and logs for denning cover and abundant coarse woody debris that support a good prey base of small mammals. Small clearings, rocky outcrops, and talus slopes are also suitable foraging habitat for American martens.

Status in Project Site: Suitable marten habitat exists in the northwestern portion of the Project site in the mixed conifer area of Jeffery pine. The majority of the Jeffrey pine stands within the Project site provide marginal quality habitat for marten due to the relative lack of snags, downed logs and large trees. Marten tracks have been seen in the vicinity of the Shady Rest Park and in association with the Jeffery pine stands. Photo point studies of the Rhyolite area have detected marten in the area to the north of the Project site.

Mule deer (Odocoileus hemionus)

Status: Mule deer is a USFS Species of Special Interest. Mule deer are also considered an important harvest species by the CDFG.

Distribution: Mule deer are a common to abundant, yearlong resident or elevational migrant with a widespread distribution throughout most of California, except in deserts and intensively farmed areas without cover

Habitat and Biology: Mule deer occur in early to intermediate successional stages of most forest, woodland, and brush habitats. Prefer a mosaic of various-aged vegetation that provides woody cover, meadow and shrubby openings, and free water. Brushy areas and tree thickets are important for escape cover. Vegetative cover is critical for thermal regulation in winter and summer. Fawning occurs in moderately dense shrublands and forests, dense herbaceous stands, and high-elevation riparian and mountain shrub habitats, with available water and abundant forage.

Status in Project Site: Suitable mule deer habitat is present throughout the Project site. Mule deer herds in Mono County are defined by their winter ranges, where they migrate to lower elevations on the Eastern Sierra to forage among pine forest, pinyon-juniper woodland, and sagebrush scrub habitats. The location of the CD-IV Project is within the general spring and fall migration path identified for members of the Round Valley Herd (Thomas, 1985; Kucera, 1988), as well as members of the Casa Diablo herd (Taylor, 1988). It is also within the expansive area that may be used by members of these herds for summer “residency”. The most recent population size estimates available for the Round Valley and Casa Diablo deer herds are 2,194 and 2,805 animals, respectively, as documented by winter range helicopter surveys in January and March, 2011 (CDFG, 2011). Scrub habitats in the Mammoth Lakes area, especially those that provide a highly palatable browse component such as bitterbrush, are crucial resources for resident adult reconditioning and fawn survival in late summer and fall months (Monteith, *et al.*, 2009).

Characteristics of the vegetation in the Project site meet known habitat requirements for deer that enter the area to hold or forage as residents, or who pass through the area during normal migration. Paulus (2011) has recently documented “resident” mule deer use of the proposed Project site for forage, cover, resting, and rearing of fawns during the period August 5 through October 4. Paulus (2012b) also documented movement patterns from October 8 through December 6 that confirm that local mule deer migration routes to their distant winter ranges cross through the Project site in Casa Diablo and Basalt Canyon, as suggested by several previous studies of the general area (Kucera, 1988; Taylor, 1988; Kerns, 2003; Monteith et al., 2009).

Sierra Nevada red fox (Vulpes vulpes necator)

Status: The Sierra Nevada red fox is listed as Threatened under the CESA and is a USFS Sensitive species.

Distribution: Little is known about the distribution and habitat requirements for Sierra Nevada red fox, as it is one of the rarest species in the state. The Sierra Nevada red fox typically occurs in subalpine habitats above 5,000 feet in the Sierra Nevada and Cascade mountain ranges of California. The current range and distribution is not fully understood; however, Sierra Nevada red fox have recently been detected near Sonora Pass, on U.S. Highway 395 near the junction with SR 108. There is also a known population in the vicinity of Lassen Peak.

Habitat and Biology: During summer months they may be found in associations with mature Jeffrey pine, lodgepole pine, and red fir forests, interspersed with meadows. In winter they appear to move downslope to be found in association with mixed conifers and Ponderosa pine forests. Specific habitat features include rock outcrops, hollow logs, and stumps for denning habitat and forest openings for hunting opportunities. Dens are located in rock areas with dense vegetation. Most known occurrences suggest its preferred habitats are higher elevation subalpine forests and alpine fell-fields.

Status in Project Site: The CD-IV Project site contains suitable foraging habitat for this species, although the most recent confirmed sighting in the region occurred nearly 25 years ago.

3.4.2 Applicable Regulations, Plans, and Policies/Management Goals

This section provides a discussion of federal, state, and regional environmental regulations, plans and standards applicable to the Project area for wildlife resources.

3.4.2.1 Federal

Federal Endangered Species Act

The FESA designates threatened and endangered animals and plants and provides measures for their protection and recovery. Under §7 of the FESA, a federal agency that authorizes, funds, or carries out a project that "may affect" a listed species or its critical habitat must consult with USFWS.

Critical Habitat

Under FESA, the Secretary of the Interior (or the Secretary of Commerce, as appropriate) formally designates critical habitat for certain federally listed species and publishes these designations in the Federal Register. Critical habitat is not automatically designated for all federally listed species, so many listed species have no formally designated critical habitat.

Critical habitat is defined as the specific areas that are essential to the conservation of a federally listed species, and that may require special management consideration or protection. Critical habitat is determined using the best available scientific information about the physical and biological needs of the species. These needs, or primary constituent elements, include: space for individual and population growth and for normal behavior; food, water, light, air, minerals, or other nutritional or physiological needs; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitat that is protected from disturbance or is representative of the historical geographic and ecological distribution of a species. Critical habitat for Owens tui chub is located approximately 2 miles east of the CD-IV Project site.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 makes it unlawful to take or attempt to take any migratory bird, any part, nest, or egg of any such bird except under the terms of a permit issued by the USDOI. In total, 836 bird species are protected by the MBTA, 58 of which are currently legally hunted as game birds. A migratory bird is any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle.

The Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

In September 2011, the BLM issued an Instruction Memo (IM) (No. 2010-156) to provide direction for renewable energy NEPA analyses to comply with the Bald and Golden Eagle Protection Act, including its implementing regulations (i.e., September 11, 2009, 50 CFR parts 13 and 22) for golden eagles, and to identify steps that may be necessary within the habitat of golden eagles to ensure environmentally responsible authorization and development of renewable energy resources. The IM requires that consideration of potential impacts to golden eagles or their habitat is incorporated into the NEPA analysis for all renewable energy projects to document whether breeding territories/nests, feeding areas, roosts, or other important golden eagle use areas are located within the analysis area. The guidance document requires that findings of "no impact" are documented in the affected environment portion of the NEPA analysis, and stipulates additional requirements if the proposed project or action has the potential to impact golden eagles or their habitat.

Bureau of Land Management Sensitive Species

BLM Sensitive Species are species designated by the State Director that are not already federally listed, proposed, or candidate species, or state-listed because of potential endangerment. BLM's policy is to "ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as threatened or endangered." Various offices of the BLM maintain a list of special-status wildlife species that are to be considered as part of the management activities carried out by the BLM on the lands that they administer.

U.S. Forest Service

The Regional Forester of the Pacific Southwest Region of the USFS is responsible for designating sensitive animal species that may be found in the Region. These species receive special protection to ensure that they do not become listed as threatened or endangered under the FESA. The Inyo National Forest maintains a subset of the Regional list that contains sensitive animal species known or suspected to occur on the forest. The ROD for the SNFPA established standards and guidelines for TEPS animal species. It requires the USFS to "Conduct field surveys for TEPS species early enough in the project planning process that the project can be designed to conserve or enhance TEPS species and their habitat." In addition, the Inyo National Forest Sensitive Plant Management Plan requires that forest activities will not disturb any sensitive species population, or part of a sensitive species' essential habitat, until its status is determined through a BE. After a BE is completed, no action is to be taken that would cause a sensitive species population to fall below the number of individuals necessary to maintain a viable population.

The SNFPA ROD also established special management objectives and standards and guidelines for identified RCAs in Inyo National Forest (USDA, Forest Service 2004). SNFPA RCA requirements include attaining and maintaining viable populations and diversity of aquatic-dependent plant species and maintaining water flows sufficient to sustain desired habitats.

FSS species are species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that plants and animals do not become threatened or endangered and to ensure their continued viability on national forests. It is Forest Service policy to analyze impacts to sensitive species to ensure management activities do not create a significant trend toward federal listing or loss of viability.

Inyo National Forest Management Indicator Species

Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) ROD signed December 14, 2007, which was developed under the 1982 National Forest System Land and Resources Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS set forth in the LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to: (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the LRMP as amended. MIS are identified as representing a group of species having similar habitat requirements. MIS are not necessarily federally listed FSS, or protected species (though they can be), and they may be abundant in the area, but are used as surrogate species for the specialized habitats they occupy.

3.4.2.2 State

California Endangered Species Act

The CESA (California Fish and Game Code § 2050 *et seq.*) provides protection and prohibits the take of plant, fish, and wildlife species listed by the State of California. Unlike FESA, state listed plants have the same degree of protection as wildlife, but insects and other invertebrates may not be listed. A CESA "take" is defined similarly to a FESA "take", and is prohibited for both listed and candidate species. Take authorization may be obtained by the project applicant from CDFG under the CESA sections 2091 and 2081. Section 2091, like FESA section 7, provides for consultation between a state lead agency under the CEQA and CDFG, with issuance of take authorization if the project does not jeopardize the listed species. Section 2081 allows take of a listed species for educational, scientific, or management purposes. In this case, private developers consult with CDFG to develop a set of measures and standards for managing the listed species, including full mitigation for impacts, funding of implementation, and monitoring of mitigation measures.

California Environmental Quality Act

CEQA (California Public Resources Code § 21000 *et seq.*) was enacted in 1970 to provide for full disclosure of environmental impacts to the public before issuance of a permit by state and local public agencies. In addition to federal or state listed species, "sensitive" plants and animals receive consideration under CEQA. Sensitive species include, but are not limited to, wildlife Species of Special Concern listed by CDFG, and plant species on the CNPS' List 1A (presumed extinct), List 1B (rare, threatened, or endangered in California and elsewhere; eligible for state listing), or List 2 (rare, threatened, or endangered in California but more common elsewhere; eligible for state listing).

California Fish and Game Code

Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code outline protection for fully protected species of mammals, birds, reptiles, amphibians, and fish. Species that are fully protected by these sections may not be taken or possessed at any time. In October 2011, SB 618 amended California Fish and Game Code provisions that relate to fully protected species. Prior to SB 618, CESA prohibited the "take" of species that have been listed as fully protected. The amendment allows for incidental take of fully protected species when a conservation plan has been approved and implemented to ensure protection of the species. Other exceptions in which CDFG may issue permits or licenses to authorize the take of fully protected species include scientific research and live capture and relocation of fully protected species pursuant to a permit for the protection of livestock. Furthermore, it is the responsibility of the CDFG to maintain viable populations of all native species. To that end, the CDFG has designated certain vertebrate species as Species of Special Concern because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

3.4.2.3 Local

Mono County General Plan

The Conservation/Open Space Element of the Mono County General Plan (Mono County, 1993) provides the following goals, objectives, and policies related to wildlife resources which are applicable to the Proposed Action:

> **Goal:** To maintain an abundance and variety of vegetation, aquatic and wildlife habitat types in Mono County for recreational use, natural diversity, scenic value, and economic benefits.
>
>> ***Objective A*****:** Maintain and restore botanical, aquatic and wildlife habitats in Mono County.
>>
>>> *Policy 1*: Future development projects shall avoid potential significant impacts to animal or plant habitats or mitigate impacts to a level of non-significance, unless a statement of overriding considerations is made through the EIR process.
>>>
>>> *Policy 2*: Protect and restore threatened and endangered plant and animal species and their habitats.
>>>
>>> *Policy 3*: Protect and restore sensitive plants, native plants, and those species of exceptional scientific, ecological, or scenic value.
>>>
>>> *Policy 4*: Prohibit construction activities such as grading in sensitive habitats prior to environmental review in compliance with CEQA and the Mono County Grading Ordinance.

Town of Mammoth Lakes General Plan

The Resource Management and Conservation Element of the Town of Mammoth Lakes General Plan (Town of Mammoth Lakes, 2007) contains several goals and policies related to wildlife resources which are applicable to the Proposed Action:

Goal R.1: Be stewards of habitat, wildlife, fisheries, forests and vegetation resources of significant biological, ecological, aesthetic and recreational value.

*Policy R.1.A***:** Be stewards of important wildlife and biological habitats within the Town's municipal boundary.

Policy R.1.B: Development shall be stewards of Special Status plant and animal species and natural communities and habitats.

Policy R.1.C: Prior to development, projects shall identify and mitigate potential impacts to site-specific sensitive habitats, including special status plant, animal species, and mature trees.

Policy R.1.D: Be stewards of primary wildlife habitats through public and/or private management programs.

Policy R.1.I: Encourage the management of forest resources in and adjacent to the town to ensure forest health, minimize insect and pathogen outbreaks and reduce fuel loading.

Goal R.2: Maintain a healthy regional natural ecosystem and provide stewardship for wetlands, wet meadows and riparian areas from development-related impacts.

Policy R.2.B: Be stewards of forested areas, wetlands, streams, significant slopes and rock outcroppings. Allow stands of trees to continue to penetrate the community to retain the mountain character of Mammoth Lakes. Minimize tree removal for development to the greatest extent possible.

Policy R.2.C: Avoid wetland disturbance to greatest extent possible by requiring all feasible project modifications.

Policy R.2.D: Mapped intermittent streams should not be placed in culverts.

3.5 Climate Change

This section provides an overview of the environmental and regulatory setting with respect to greenhouse gas (GHG) emissions and global climate change. A brief overview of climate change is followed by a discussion of the various GHGs that have been identified as drivers of climate change, and pertinent regulations, including those relevant at federal, state, and local levels.

3.5.1 Environmental Setting

3.5.1.1 Climate Change

There is general scientific consensus that climate change is occurring and that human activity contributes in some measure (perhaps substantially) to that change. Man-made emissions of GHGs, if not sufficiently curtailed, are likely to contribute further to continued increases in global temperatures. Some of the potential effects of global warming in California may include loss of snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CARB, 2009). Globally, climate change has the potential to impact numerous environmental resources through potential, though uncertain, impacts related to future air temperatures and precipitation patterns. According to the International Panel on Climate Change (IPCC), the projected effects of global warming on weather and climate are likely to vary regionally, but are expected to include the following direct effects (IPCC, 2007):

1. Higher maximum temperatures and more hot days over nearly all land areas;
2. Higher minimum temperatures, fewer cold days and frost days over nearly all land areas;
3. Reduced diurnal temperature range over most land areas;
4. Increase of heat index over land areas; and
5. More intense precipitation events.

Also, there are many secondary effects that are projected to result from global warming, including global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity. While the possible outcomes and the feedback mechanisms involved are not fully understood and much research remains to be done, the potential for substantial environmental, social, and economic consequences over the long term may be great.

CARB estimated that in 2008, California produced 478 million gross metric tons of carbon dioxide-equivalent (CO_2e) emissions. CARB found that transportation was the source of 37 percent of the state's GHG emissions; followed by electricity generation at 24 percent, and industrial sources at 19 percent (CARB, 2010).

3.5.1.2 Greenhouse Gases

Generation of electricity can produce GHGs in addition to the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts. For traditional sources of electricity, such as fossil fuel-fired power plants, GHG emissions include primarily carbon dioxide (CO_2), with much smaller amounts of nitrous oxide (N_2O), and methane (CH_4; often from unburned natural gas). Other sources of GHG emissions include sulfur hexafluoride (SF_6) from high voltage power equipment and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/ chiller equipment. Because these different GHGs have different warming potential (i.e., the amount of heat trapped by a certain mass of a GHG), and CO_2 is the most common reference gas for climate change, GHG emissions often are quantified and reported as CO_2e. For example, SF_6, while representing a small fraction of the total GHGs emitted annually worldwide, is a very potent GHG with 23,900 times the global warming potential of CO_2. Therefore, an emission of one metric ton of SF_6 would be reported as an emission of 23,900 metric tons CO_2e. Large emission sources are reported in million metric tons[1] of CO_2e.

GHG emissions from the electricity sector are dominated by CO_2 emissions from carbon-based fuels. Other sources of GHG emissions are small and also are more likely to be easily controlled or reused or recycled, but are nevertheless documented here as some of the compounds that have very high global warming potentials. These air pollutants are considered to be GHGs because their presence in the atmosphere results in increased solar absorbance, and/or prevents heat from the surface of the Earth from escaping to space. The principal GHGs resulting from human activity that enter and accumulate in the atmosphere are described below.

Carbon Dioxide

CO_2 is a naturally occurring gas that enters the atmosphere through natural as well as anthropogenic sources. Key anthropogenic sources include: the burning of fossil fuels (e.g., oil, natural gas, coal, etc.); solid waste; trees, wood products, and other biomass; and industrially relevant chemical reactions such as those associated with manufacturing cement. CO_2 is removed from the atmosphere when it is absorbed by plants as part of the biological carbon cycle.

Methane

Like CO_2, CH_4 is emitted from both natural and anthropogenic sources. Key anthropogenic sources of CH_4 include gaseous emissions from landfills, releases associated with mining and materials extraction industries, in particular coal mining, and fugitive releases associated with the extraction and transport of natural gas and crude oil. CH_4 emissions also result from livestock and agricultural practices. Small quantities of CH_4 are released during fossil fuel combustion.

Nitrous Oxide

N_2O is also emitted from both natural and anthropogenic sources. Important anthropogenic source activities include industrial activities, agricultural activities (primarily application of nitrogen fertilizer), the use of explosives, combustion of fossil fuels, and decay of solid waste.

Fluorinated Gases

HFCs, PFCs, and SF_6 are synthetic gases that are emitted from a variety of industrial processes and contribute substantially more to the greenhouse effect than the GHGs described

1 A metric ton is 1,000 kilograms; it is equal to approximately 1.1 U.S. tons and approximately 2,204.6 pounds.

previously. Fluorinated gases are often used as substitutes for ozone-depleting substances (i.e., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). These gases are typically emitted in small quantities, but because they are potent GHGs, they are sometimes referred to as high global warming potential gases.

Greenhouse Gas Sources

Anthropogenic GHG emissions in the United States derive mostly from the combustion of fossil fuels for transportation and power production. Energy-related CO_2 emissions, resulting from fossil fuel exploration and use, account for approximately three-quarters of the human-generated GHG emissions in the United States, primarily in the form of CO_2 emissions from burning fossil fuels. More than half of the energy-related emissions come from large stationary sources such as power plants; approximately a third derive from transportation; while industrial processes, agriculture, forestry, other land uses, and waste management compose a majority of the remaining sources (USEPA, 2011a).

In California, renewable electricity sources have been given preference over fossil fuel fired electricity sources. This means that when renewable energy is available on the grid, the California Independent Systems Operator (CAISO) requests turn-down of fossil power production. For example, when solar- or wind-based renewable facilities go off-line, the CAISO can request that fossil power production be turned up if there is still demand. Some fossil fuel load-following plants will adjust automatically as solar- and wind-based renewable sources come on- and off-line. With regard to the CD-IV Project, which would be a baseload[2] renewable facility that would contribute energy to the grid continuously, fossil power production would be displaced evenly throughout the day. As a result of these operating scenarios, new renewable energy power plants operating in California offset the production of electricity from fossil fuel fired power plants.

3.5.2 Applicable Regulations, Plans, and Policies/Management Goals

3.5.2.1 Federal

U.S. Environmental Protection Agency

On April 2, 2007, in *Massachusetts v. EPA*, 549 US 497, the Supreme Court found that GHGs are air pollutants covered by the Clean Air Act. The Court held that the USEPA must determine whether or not emissions of GHGs from new motor vehicles cause or contribute to air pollution, which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In making these decisions, the USEPA is required to follow the language of §202(a) of the Clean Air Act. The Supreme Court decision resulted from a petition for rulemaking under §202(a) filed by more than a dozen environmental, renewable energy, and other organizations.

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2 Baseload plants are the production facilities used to meet some or all of a given region’s continuous energy demand, and produce energy at a constant rate.

On April 17, 2009, the Administrator signed proposed endangerment and cause or contribute findings for GHGs under §202(a) of the Clean Air Act. The USEPA held a 60-day public comment period, which ended June 23, 2009, and received over 380,000 public comments. These included both written comments as well as testimony at two public hearings in Arlington, Virginia, and Seattle, Washington. The USEPA reviewed, considered, and incorporated public comments and has issued final Findings.

The USEPA found that six GHGs taken in combination endanger both the public health and the public welfare of current and future generations. The USEPA also found that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the greenhouse effect as air pollution that endangers public health and welfare under the Clean Air Act §202(a) (USEPA, 2011b).

Specific GHG Regulations that the USEPA has adopted to date are as follows:

> ***40 CFR Part 98. Mandatory Reporting of Greenhouse Gases Rule.*** This rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2e emissions per year (USEPA, 2011c). The Project would not trigger GHG reporting as required by this regulation.
>
> ***40 CFR Part 52. Proposed Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule.*** USEPA recently mandated to apply Prevention of Significant Deterioration (PSD) and Title V requirements to facilities whose stationary source CO_2e emissions exceed 100,000 tons per year (USEPA, 2011b). The CD-IV Project would not trigger PSD or Title V permitting under this regulation.

Order No. 3289

On September 14, 2009, Secretary of the Interior Ken Salazar issued Order No. 3289, addressing the impacts of climate change on domestic water, land, and other natural and cultural resources. The Order establishes an approach for increasing understanding of climate change and responding to potential climate change-related impacts as relevant to the resources that the DOI manages. The document specifically identifies potential impact areas including potential changes in flood risk and water supply, sea level rise, changes in wildlife and habitat populations and their migration patterns, new invasions of exotic species, and increased threat of wildland fire. The Order includes Climate Change Response Planning Requirements, which require each bureau and office within the DOI (including BLM) to consider and analyze potential climate change impacts when undertaking long range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under DOI's purview.

3.5.2.2 State

There are a variety of statewide rules and regulations that have been implemented or are in development in California that mandate the quantification or reduction of GHGs. Under CEQA, an analysis and mitigation of GHG emissions and climate change in relation to a proposed project is required where it has been determined that a project would result in a significant addition of GHGs to the atmosphere.

Renewables Portfolio Standard

California's Renewables Portfolio Standard (RPS) was established in 2002 by SB 1078, and the initial standard has since been accelerated through a number of executive and legislative actions, the most recent of which are described below. The RPS program currently requires investor-owned utilities, electric service providers, and community choice aggregators to procure 33 percent of electricity from eligible renewable energy resources by 2020. The program is jointly implemented by the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC).

Executive Order S-3-05

Executive Order S-3-05 was established by Governor Arnold Schwarzenegger in June 2006, and establishes statewide emission reduction targets through the year 2050 as follows:

1. by 2010, reduce GHG emissions to 2000 levels;
2. by 2020, reduce GHG emissions to 1990 levels; and
3. by 2050, reduce GHG emissions to 80 percent below 1990 levels.

This Executive Order does not include any specific requirements that pertain to the CD-IV Project. However, future actions taken by the state to implement these goals may affect the CD-IV Project, depending on the specific implementation measures that are developed.

Executive Order S-14-08

Executive Order S-14-08 was established by Governor Arnold Schwarzenegger in November 2008. Executive Order S-14-08 improves processes for licensing renewable projects by directing state agencies to create comprehensive plans to prioritize regional renewable projects based on an area's renewable resource potential and the level of protection for plant and animal habitat. To implement and track the progress of the Executive Order, the CEC and CDFG signed a Memorandum of Understanding formalizing a Renewable Energy Action Team which will concurrently review permit applications filed at the state level to streamline the application process for renewable energy development. The specifics of this executive order include the following:

1. Requires retail sellers of electricity to serve 33 percent of their load with renewable energy by 2020;

2. Requires various state agencies to streamline processes for the approval of new renewable energy facilities and determine priority renewable energy zones; and

3. Establishes the requirement for the creation and adoption of the Desert Renewable Energy Conservation Plan (DRECP) process for the Mojave and Colorado Desert regions.

This Executive Order does not include any specific requirements that pertain directly to the CD-IV Project. However, the CD-IV Project, as a renewable energy project, would help the utility contracting the power from this project to meet the established RPS standard. Senate Bill 2, enacted in 2011, codifies the requirement of 33 percent renewable electricity sources by 2020.

Senate Bill 1368

SB 1368 was enacted in 2006, and required the CPUC to establish a CO_2 emissions standard for base load generation owned by or under long-term contract with publicly owned utilities. The CPUC established a GHG Emissions Performance Standard (EPS) of 1,100 pounds of CO_2 per megawatt-hour (MWH). SB 1368 also requires the posting of notices of public deliberations by publicly owned companies on the CPUC website and establishes a process to determine compliance with the EPS. The CD-IV Project, as a renewable energy generation facility, is determined by rule to comply with the GHG Emission Performance Standard requirements of SB 1368.

Assembly Bill 32

AB 32, *the Global Warming Solutions Act of 2006*, requires CARB to establish a statewide GHG emissions cap for 2020 based on 1990 emission levels. AB 32 required CARB to adopt regulations by January 1, 2008, that identify and require selected sectors or categories of emitters of GHGs to report and verify their statewide GHG emissions, and CARB is authorized to enforce compliance with the program. Under AB 32, CARB also was required to adopt, by January 1, 2008, a statewide GHG emissions limit equivalent to the statewide GHG emissions levels in 1990, which must be achieved by 2020. CARB established this limit in December 2007 at 427 million metric tons of CO_2e. This is approximately 30 percent below forecasted “business-as-usual” emissions of 596 million metric tons of CO_2e in 2020, and about 10 percent below average annual GHG emissions during the period of 2002 through 2004 (CARB, 2009).

By January 1, 2011, CARB was required to adopt rules and regulations (to be implemented by January 1, 2012), to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 permits the use of market-based compliance mechanisms to achieve those reductions. AB 32 also requires CARB to monitor compliance with and enforce any rule, regulation, order, emission limitation, emissions reduction measure, or market-based compliance mechanism that it adopts.

In June 2007, CARB directed staff to pursue 37 early strategies for reducing GHG emissions under AB 32. The broad spectrum of strategies that were developed, including a Low Carbon Fuel Standard, regulations for refrigerants with high global warming potentials, guidance and protocols for local governments to facilitate GHG reductions, and green ports, reflects that the serious threat of climate change requires action as soon as possible.

In addition to approving the 37 GHG reduction strategies, CARB directed staff to further evaluate early action recommendations made at its June 2007 meeting, and to report back to CARB within six months. The general sentiment of CARB suggested a desire to try to pursue greater GHG emissions reductions in California in the near-term. Since the June 2007 CARB hearing, CARB staff has evaluated all 48 recommendations submitted by stakeholders and several internally generated staff ideas and published the *Expanded List of Early Action Measures To Reduce Greenhouse Gas Emissions In California Recommended For Board Consideration* in September 2007 (CARB, 2007). CARB adopted nine Early Action Measures for implementation, including Ship Electrification at Ports, Reduction of High Global-Warming-Potential Gases in Consumer Products, Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency), Reduction of Perfluorocarbons from Semiconductor Manufacturing, Improved Landfill Gas Capture, Reduction of Hydroflourocarbon-134a from Do-It-Yourself Motor Vehicle Servicing, Sulfur Hexaflouride Reductions from the Non-Electric Sector, a Tire Inflation Program, and a Low Carbon Fuel Standard.

Climate Change Scoping Plan

In December 2008, CARB approved the AB 32 Scoping Plan outlining the state's strategy to achieve the 2020 GHG emissions limit (CARB, 2009). This Scoping Plan, developed by CARB in coordination with the Climate Action Team (CAT), proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify California's energy sources, save energy, create new jobs, and enhance public health. The measures in the Scoping Plan will continue to be developed over the next year and are scheduled to be in place by 2013. The Scoping Plan expands the list of the nine Early Action Measures into a list of 39 Recommended Actions contained in Appendices C and E of the Scoping Plan. These measures are presented in Table 3.5-1.

Senate Bill 97

In 2007, the California State Legislature passed SB 97, which required amendment of the CEQA Guidelines to incorporate analysis of, and mitigation for, GHG emissions from projects subject to CEQA. The California Natural Resources Agency adopted these amendments on December 30, 2009, and they took effect March 18, 2010.

The amendments add §15064.4 to the CEQA Guidelines. This new section specifically addresses the potential significance of GHG emissions. §15064.4 calls for a "good-faith effort" to "describe, calculate or estimate" GHG emissions; §15064.4 further states that the analysis of the significance of any GHG impacts should include consideration of the extent to which the project would increase or reduce GHG emissions; exceed a locally applicable threshold of significance; and comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions." The new *Guidelines* also state that a project may be found to have a less-than-significant impact related to GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (§15064(h)(3)). Importantly, however, the CEQA Guidelines do not require or recommend a specific analytical methodology or provide quantitative criteria for determining the significance of GHG emissions.

TABLE 3.5-1
RECOMMENDED ACTIONS OF CLIMATE CHANGE SCOPING PLAN

ID #	Sector	Strategy Name
T-1	Transportation	Pavley I and II – Light-Duty Vehicle GHG Standards
T-2	Transportation	Low Carbon Fuel Standard (Discrete Earl Action)
T-3	Transportation	Regional Transportation-Related GHG Targets
T-4	Transportation	Vehicle Efficiency Measures
T-5	Transportation	Ship Electrification at Ports (Discrete Early Action)
T-6	Transportation	Goods-movement Efficiency Measures
T-7	Transportation	Heavy Duty Vehicle Greenhouse Gas Emission Reduction Measure – Aerodynamic Efficiency (Discrete Early Action)
T-8	Transportation	Medium and Heavy-Duty Vehicle Hybridization
T-9	Transportation	High Speed Rail
E-1	Electricity and Natural Gas	Increased Utility Energy efficiency programs ; More stringent Building and Appliance Standards
E-2	Electricity and Natural Gas	Increase Combined Heat and Power Use by 30,000 gigawatt-hours (GWh)
E-3	Electricity and Natural Gas	Renewables Portfolio Standard
E-4	Electricity and Natural Gas	Million Solar Roofs
CR-1	Electricity and Natural Gas	Energy Efficiency
CR-2	Electricity and Natural Gas	Solar Water Heating
GB-1	Green Buildings	Green Buildings
W-1	Water	Water Use Efficiency
W-2	Water	Water Recycling
W-3	Water	Water System Energy Efficiency
W-4	Water	Reuse Urban Runoff
W-5	Water	Increase Renewable Energy Production
W-6	Water	Public Goods Charge (Water)
I-1	Industry	Energy Efficiency and Co-benefits Audits for Large Industrial Sources
I-2	Industry	Oil and Gas Extraction GHG Emission Reduction
I-3	Industry	GHG Leak Reduction from Oil and Gas Transmission
I-4	Industry	Refinery Flare Recovery Process Improvements
I-5	Industry	Removal of Methane Exemption from Existing Refinery Regulations
RW-1	Recycling and Waste Management	Landfill Methane Control (Discrete Early Action)
RW-2	Recycling and Waste Management	Additional Reductions in Landfill Methane – Capture Improvements
RW-3	Recycling and Waste Management	High Recycling/Zero Waste
F-1	Forestry	Sustainable Forest Target
H-1	High Global Warming Potential (GWP) Gases	Motor Vehicle Air Conditioning Systems (Discrete Early Action)
H-2	High GWP Gases	SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)
H-3	High GWP Gases	Reduction in Perfluorocarbons in Semiconductor Manufacturing (Discrete Early Action)
H-4	High GWP Gases	Limit High GWP Use in Consumer Products (Discrete Early Action, Adopted June 2008)
H-5	High GWP Gases	High GWP Reductions from Mobile Sources
H-6	High GWP Gases	High GWP Reductions from Stationary Sources
H-7	High GWP Gases	Mitigation Fee on High GWP Gases
A-1	Agriculture	Methane Capture at Large Dairies

SOURCE: CARB, 2009

17 CCR §95350 et seq.

The purpose of this regulation is to achieve GHG emission reductions by reducing SF_6 emissions from gas-insulated switchgear (GIS). GIS owners must not exceed maximum allowable annual emissions rates, which are reduced each year until 2020, after which annual emissions must not exceed 1.0 percent. GIS owners must regularly inventory GIS equipment and measure quantities of SF_6 and maintain records of these for at least 3 years. Additionally, by June 1, 2012, and June 1 of each year thereafter, each GIS owner must submit an annual report to the Executive Officer for emissions that occurred during the previous calendar year.

3.5.2.3 Local

The GBUAPCD rules and the Mono County General Plan were reviewed for GHG-related rules and/or policies that would be applicable to the CD-IV Project. No policies were found to be relevant to the CD-IV Project.

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3.6 Cultural and Paleontological Resources

3.6.1 Introduction to Cultural Resources

Information presented in this section is based on data provided by: MACTEC (2012) technical report "A Class III Cultural Resources Inventory for the Basalt Canyon Project, Mono County, California;" Haverstock (2012) technical report "An Expanded Cultural Resources Inventory Report for the Proposed Casa Diablo IV Geothermal Project, BLM Project: CA-170-12-31;" on-site meetings between US Forest Service Inyo National Forest (USFS), BLM, ESA, and Pacific Legacy; and discussions with the California Office of Historic Preservation (OHP). "Cultural resources" as used in this document refers to all historical and archaeological resources, regardless of significance.

The BLM is the lead agency for the purpose of complying with the National Environmental Policy Act (NEPA).and the USFS is a cooperating agency. The Geothermal Steam Act of 1970 (30 USC 1001 et seq.) establishes rules and regulations for the leasing of geothermal resources on lands managed by federal agencies. The BLM has issued regulations addressing the leasing of geothermal resources (43 CFR 3200). The BLM is the lead Federal agency under Section 106 of National Historic Preservation Act (NHPA) of 1966, as amended, in accordance with 36 CFR § 800.2(a)(2). The applicant proposes to build, operate, and decommission the Casa Diablo IV Geothermal Development (CD-IV) Project in the vicinity of the existing MPLP geothermal complex near the Town of Mammoth Lakes in Mono County, California.

3.6.2 Regulatory Framework for Cultural Resources

3.6.2.1 Federal Regulations

There are numerous federal regulations, executive orders, and policies that direct management of cultural resources on federal lands, acts by federal agencies (including permitting), and projects that receive federal funding. These regulations include the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Action, the Native American Graves Protection and Repatriation Act (NAGPRA), the Antiquities Act of 1906, Executive Order 13007 (Indian Sacred Sites), and Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments). The following text discusses the most pertinent laws affecting the proposed project.

The NHPA is the principal federal law addressing cultural resources, as amended (16 USC. Section 470), and its implementing regulations (36 CFR 800). Section 106 of the NHPA requires that a federal agency with jurisdiction over a proposed project (referred to as an undertaking under the NHPA) evaluate the effect of the undertaking on historic properties in consultation with Indian tribes, the State Historic Preservation Office (SHPO), and local government. The CD-IV Project is an undertaking, as defined by 36 CFR 800.3, and therefore is subject to Section 106. The term "historic properties" refers to districts, sites, buildings, structures, objects or cultural resources that are included in, or are eligible for listing in the National Register.

In order to be eligible for listing in the National Register, historical or cultural resources are generally, but not always, at least 50 years old, have integrity, and meet at least one of the four criteria listed below. Integrity is the property's ability to convey its demonstrated historical significance through location, design, setting, materials, workmanship, feeling, and association. The four eligibility criteria set forth in 36 CFR, 60.4 are as follows:

A) Association with events that have made a significant contribution to the broad patterns of our history;

B) Association with the lives of persons significant to our past;

C) Resources that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D) Resources that have yielded or may be likely to yield information important in prehistory or history.

Implementing regulations for Section 106 of the NHPA (36 CFR, Part 800) outline the procedures for identifying and evaluating eligible properties. Regulations also discuss procedures to assess the effects of an undertaking on those historic properties, in consultation with interested parties, and to identify ways to avoid, reduce, or minimize adverse effects on those properties. Section 106 does not require the preservation of historic properties, but it is designed to ensure that the decisions of federal agencies concerning the treatment of these places result from meaningful considerations of cultural and historic values and of the options available to protect the properties. The federal lead agency also consults with Indian tribes on a government-to-government level in accordance with several authorities, including NEPA, the NHPA, and Executive Orders 13007 and 13175. The 1992 amendments to the NHPA strengthened tribal involvement in the process (see 5.2.3). The Advisory Council on Historic Preservation provides guidance and advice on the application of the procedures, and generally oversees the operation of the Section 106 process.

Executive Order 13007 directs federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners, as long as those uses are done in a manner consistent with other regulations. It requires federal agencies to avoid adversely affecting the physical integrity of sacred sites "to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions."

Requirements for responding to discoveries of Native American human remains and funerary objects, sacred objects, or objects of cultural patrimony on federal or tribal land are addressed under the NAGPRA (Public Law 101-601) and its implementing regulations found at Title 43 CFR Part 10.

The BLM is responsible for government-to-government consultation with federally recognized Indian tribes and is the lead federal agency for all tribal consultation and coordination. The following are federally recognized tribes: Bishop Paiute Tribe; Utu Utu Gwaitu Paiute Tribe of the Benton Paiute Reservation; and Big Pine Paiute Tribe of the Owens Valley, Bridgeport Indian Colony. The non federally recognized tribe Mono Lake Kutzadika', a Paiute Indian Community, may attach religious and cultural significance to parts of the Project area. The USFS initiated the consultation process in May 2010, and will continue for the duration of the undertaking. To date, the consultation effort has contacted tribal leaders and members through certified letters, presentations at tribal meetings, email, and a field trip to the project area.

3.6.2.2 State Regulations

There are numerous state regulations and policies that direct management of cultural resources on state lands and by state agencies. The following is a discussion of the most pertinent laws affecting the proposed project and impact analysis from a state perspective.

Historical Resources

Under CEQA (§21084.1), a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. The *CEQA Guidelines* (§15064.5) recognize that a historical resource includes: (1) a resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources (California Register); (2) a resource included in a local register of historical resources, as defined in PRC section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC section 5024.1(g); and (3) any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California by the lead agency, provided the lead agency's determination is supported by substantial evidence in light of the whole record. The fact that a resource does not meet the three criteria outlined above does not preclude the lead agency from determining that the resource may be an historical resource as defined in PRC section 5020.1(j) or 5024.1.

If a lead agency determines that an archaeological site is a historical resource, the provisions of section 21084.1 of CEQA and section 15064.5 of the *CEQA Guidelines* apply. If a project may cause a substantial adverse change (defined as physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired) in the significance of an historical resource, the lead agency must identify potentially feasible measures to mitigate these effects (*CEQA Guidelines* sections 15064.5(b)(1), 15064.5(b)(4)).

If an archaeological site does not meet the criteria for a historical resource contained in the *CEQA Guidelines*, then the site may be treated in accordance with the provisions of section 21083, which is as a unique archaeological resource. As defined in section 21083.2 of CEQA a "unique" archaeological resource is an archaeological artifact, object, or site, about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information;

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type; or,

3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

If an archaeological site meets the criteria for a unique archaeological resource as defined in section 21083.2, then the site is to be treated in accordance with the provisions of section 21083.2, which state that if the lead agency determines that a project would have a significant effect on unique archaeological resources, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place (§21083.1(a)). If preservation in place is not feasible, mitigation measures shall be required.

The *CEQA Guidelines* note that if an archaeological resource is neither a unique archaeological nor a historical resource, the effects of the project on those resources shall not be considered a significant effect on the environment (*CEQA Guidelines* §15064.5(c)(4)).

For this EIS/EIR, effects on historical resources may be considered impacts of the project. Under CCR, Title 14, Chapter 11.5, properties listed on or formally determined to be eligible for listing in the National Register are automatically eligible for listing in the California Register.

A resource is considered eligible for inclusion in the California Register, and therefore a historical resource under CEQA, if it is at least 50 years old and meets at least one of the California Register eligibility criteria, or it can be demonstrated that sufficient time has passed to understand its historical importance. Similar to the National Register, the criteria for California Register eligibility are as follows:

1. An association with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.

2. An association with the lives of persons important to local, California, or national history.

3. An embodiment of the distinctive characteristics of a type, period, region, or method of construction, or a representation of the work of a master, or possesses high artistic values.

4. A resource that has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

Human Remains

Impacts on Native American burials on non-federal land are considered under CCR, Title 14, Chapter 3, section 15064.5(d)(1), Public Resource Code section 5097.98, and Health and Safety Code section 7050.5. When an agency identifies the existence of, or the probable likelihood of, Native American human remains on non-federal land within the project, the lead agency is required to work with the appropriate descendants, as identified by the Native American Heritage

Commission. In the event of an accidental discovery, the procedures outlined in CCR, Title 14, Chapter 3, section 15064.5(e) will be followed.

3.6.3 Affected Environment for Cultural Resources

3.6.3.1 Area of Potential Effects

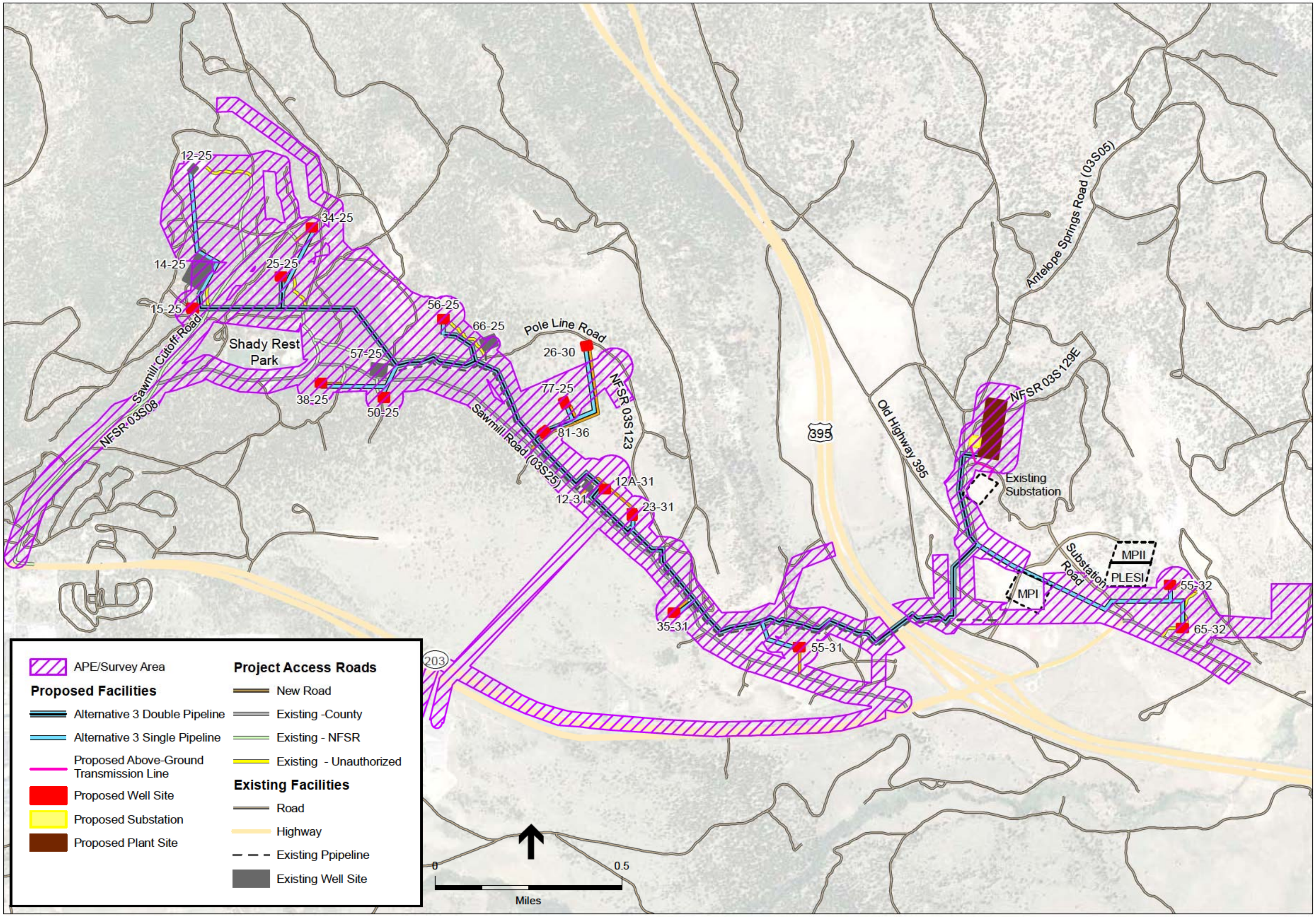
The Area of Potential Effects (APE), as illustrated in Figure 3.6-1, has been drawn to include an area sufficient to accommodate Alternative 3 project components. The BLM has determined that the undertaking may adversely affect properties eligible for listing in the National Register, and is consulting with the OHP pursuant to 36 CFR Part 800, of the regulations implementing Section 106 of NHPA (16 U.S.C. § 470f).

The APE for the Proposed Action defines an area sufficient to accommodate all alternatives considered, and the footprint of project facilities in the Alternative 3 project design. It includes all areas where ground disturbing activities could occur including access and staging areas. MACTEC, in consultation with ORNI 50, LLC and the USFS, identified features, areas, and buffer zones that would require intensive cultural resources inventory for the proposed undertaking. The land to be surveyed included 9.5 miles of proposed pipeline, 12 5-acre well pads (2.5 acre well pad with a 2.5 acre buffer for work and staging areas), and 16.5 acres for the proposed power generation plant site. In total, 331 acres are included in the APE.

3.6.3.2 Natural Environment

The APE is located at the western edge of the greater Basin and Range physiographic province. Drill pads and pipeline routes are along the drainages and slopes of Sawmill Ridge and Obsidian Hill. The region around the APE is characterized by a variety of landforms including rugged, high-relief mountains, broad volcanic massifs and tablelands, and wide alluvial valleys (Kleinhampl et al., 1974:1). Within the APE, the Long Valley caldera (a large volcanic crater) is the primary landform. Elevation within the APE ranges from 7,040 feet above mean sea level (amsl) at the northern terminus to 7,740 feet amsl. Environmental descriptions of the region surrounding the CD-IV Project can be found in numerous scientific journals guidebooks (Hill, 1975; Whitney, 1979).

The topography and geophysical nature of the region is a result of both the formation of the Sierra Nevada Range and continuing volcanic activity within the area. This volcanic activity provided resources used by prehistoric inhabitants of the region. The extensive volcanic activity that occurred during the Quaternary Period has also resulted in a rich lithic landscape, with a high density of obsidian sources, including Casa Diablo, located within this fairly limited geographic area. Many of the hot springs and geysers that resulted from continuing volcanic episodes in the region were also used prehistorically, and continue to be used today.



SOURCE: USFS, 2011; Ormat, 2011; NAIP, 201

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.6-1
APE/Survey Area with Alternative 3

3.6.3.3 Prehistoric Background

The archaeological record for the area around the APE indicates that native groups have exploited local resources at least the last 8,000 years. During this time, there have been noticeable shifts in settlement patterns, technology, and subsistence strategies (Moratto, 1984). The USFS, BLM, and California OHP concur that the resurgent dome area of the Long Valley Caldera in Mono County, California circumscribes a National Register archaeological district characterized by pre-contact Native American use of the volcanic field, designated as the Casa Diablo Obsidian Quarry Archaeological District. This District has not been subject to complete and comprehensive archaeological survey and inventory, but understanding of the prehistoric past within the APE is best understood in the context of this larger framework. District boundaries will be based on topographic and geological features that circumscribe culturally important natural volcanic features such as obsidian outcrops and hot springs, and a high density of archaeological sites. Archaeological sites within this district include: obsidian quarries; stoneworking locations; short-term resource procurement sites, midden sites reflecting intensive and repeated use for domestic activities, food processing sites, rock rings, bow stave trees, and rock shelters. A characteristic at most sites within the district is broken obsidian tools and tool manufacturing debris, often in abundance, reflecting procurement and use of obsidian.

Within 50 miles of the APE, several obsidian sources were used in prehistoric times. These include, from closest to most distant: Casa Diablo (immediately adjacent and within the APE), Mono Craters (18 miles), Mono Glass Mountain (20 miles), Truman/Queen (29 miles), Bodie Hills (43 miles), and Mt. Hicks (43 miles). The distribution of artifacts manufactured from Casa Diablo obsidian suggests that this raw material was accessible (through direct access, trade, or exchange) to prehistoric peoples in California’s Central Valley, Owens Valley, and the Sierra Nevada, as far north as the Carson Desert, and as far east as Eureka County, Nevada (Hauer, 2005; Jackson and Ericson, 1994; Thomas, 1985). Casa Diablo obsidian is a durable and abundant archaeological indicator of the extensive exchange networks that once existed between western Great Basin and central California-based peoples.

by Bettinger and Taylor (1974) proposed one of the earlier cultural chronologies for the area. Their proposed periods are the Lake Mohave (> 5,950 BP), Little Lake (5,950–3,150 BP), Newberry (3,150–1,350 BP), Haiwee (1,350–650 BP), and Marana (650–100 BP). Researchers established temporal periods primarily through correlation of projectile point styles. Haverstock (2012) discusses the further development of these periods, as archaeologists further recognized the cultural complexity of the area.

1. Lake Mohave and Silver Lake Series projectile points dominate Lake Mohave Period (> 5,950 BP) sites. Researchers have identified few sites that date to Lake Mohave Period, the majority of these are within the vicinity of Mono Basin, Long Valley, and Bishop. Sites dating to this period are typically simple lithic scatters consisting of projectile points and flaked tools. Flaked tools are manufactured from a wide variety of far-ranging obsidian sources, which has led many researchers to infer peoples living during this period were highly mobile. The distribution of lithic sources from sites dating to this period indicates that access to lithic sources was not restricted (Basgall, 1988; Douglas et al., 1998; Eerkens and King, 2002; Jurich et al., 2000; Richman and Basgall, 1998).

2. Little Lake (5,950–3,3150 BP) adaptations are inferred to be a response to Middle Holocene warming and drying (Elston, 1986). Formal tools are typically reworked or rejuvenated suggesting a high degree of curation (Overly, 2004). Obsidian distribution indicates a high degree of mobility, but again there is no evidence of patterning. Many researchers have addressed this period in this region (e.g., Basgall and Hall, 2001; Bettinger and Taylor, 1974; Zeanah et al., 2000, Zeanah and Leigh, 2002).

3. A predominance of Elko series projectile points distinguishes the Newberry Period (3,500–1,350 BP), although other dart point types are also present. Site assemblages dating to the Late Newberry Period are task oriented suggesting an increase in the amount of logistical forays (Tadlock and Tadlock, 1972). In addition, there is an increased use of caches. Obsidian production and exchange reached its zenith during this period. This increase in production and exchange may be related to the emergence of a regularized settlement pattern (Eerkens and King, 2002:14).

4. The appearance of Rose Springs and Eastgate series during the Haiwee Period (1,350–650 BP) reflects this shift in hunting technology to bow and arrow technology. There is a significant shift in subsistence-settlement patterns and food procurement strategies during the Haiwee Period, as reflected in the archaeological literature (Bettinger, 1991; Eerkens and King, 2002; Overly, 2003; Zeanah and Leigh, 2002).

5. Marana Period (650–150 BP) sites are associated with the appearance of Desert Side-notched and Cottonwood Series projectile points. During this period, ceramics become common. Obsidian procurement patterns become more restricted and territorial boundaries may have been established.

Definition of the Casa Diablo Obsidian National Register District will better define and reflect land use and exploitation of the area's resources over time. It will also further explore the important role of Casa Diablo obsidian in regional prehistory, and acknowledge continuation of exchange patterns into the ethnographic period.

3.6.3.4 Ethnographic Background

The following description of the ethnography of the region surrounding the APE is adapted from Zeanah and Leigh, 2002. More extensive information can be found in the numerous reviews of the ethnographic data for the region (e.g. Adams, 1986; Bettinger, 1982; Busby et al., 1979; Davis, 1962, 1965; Hall, 1983; Fowler and Lilejeblad, 1986; Jackson, 1985).

Most of the ethnographic investigations in the Inyo-Mono county area focused on the relatively dense aboriginal population centers in Owens Valley and near Mono Lake. Consequently, the information for the area of Long Valley caldera is comparatively limited. The Long Valley caldera is bordered by the Mono Lake Paiute to the north, the Owens Lake Paiute to the south, the Monache and southern Sierra Miwok to the west, and the Paiute of Benton and Round Valley to the east. Long Valley may have either been a seasonally exploited area used by these neighboring groups or the home of a locally distinct group. The region has alternately been placed within the territory of both the Mono Lake Paiute and the Owens Valley Paiute (Kroeber, 1925; Lamb, 1958; Merriam, 1955).

Linguistically, Kroeber (1907, 1925) placed Northern Paiute language within the Plateau Shoshonean branch of Shoshone languages. Lamb (1958) included their language within the Numic language family. Distinct, often mutually intelligible dialects have been identified in the Owens Valley and the Mono Basin areas, with intelligibility decreasing with distance (Steward, 1933).

The sociopolitical organization of the various groups in the region varied. The Owens Valley Paiute exhibited what Bettinger (1977a) termed a "Desert Village" strategy wherein distinct districts were composed of autonomous villages with year-round occupation and seasonal, task-oriented sites. The Mono Lake Paiute, by contrast, exhibited Bettinger's (1977b) "Desert Culture" strategy. The "Desert Culture" consisted of smaller, family group settlements that moved throughout the landscape based on seasonally available resources, with larger groups aggregating during the winter months.

The general subsistence patterns that fit within these two sociopolitical organizational strategies were likely similar. Like other Great Basin groups, both the Mono Basin and Owens Valley peoples exploited seasonally available plant and animal resources within what has been termed the seasonal round. Springtime resources included greens, roots and bulbs, and deer. Early summer subsistence activities centered around the collection and processing of plants such as wild rye, rice grass, and desert peach, with deer and mountain sheep hunting taking place later in the summer. Both groups collected Pandora moth (Coloradia Pandora blake) larvae from Jeffrey pine woodland in Long Valley (Davis, 1965; Steward, 1933, 1934). Fall subsistence activities included communal antelope and rabbit drives, and piñyon nut harvesting.

Several researchers have demonstrated that there was interaction between Euro-American settlers and native peoples in the area. For example, Arkush's (1995) work at CA-MNO-2122 (northeast of the project area) has contributed greatly to our understanding of the impact Euro-American settlers had on native groups.

The presence of Native Americans in the Mammoth area during the early 20th century is discussed in the memoirs of Olive Barker (1917–1920 in Reed 1982). She first mentions a small group of Paiute camped at Casa Diablo Hot Springs, just a few miles east of Mammoth Lakes. The band, however, was believed to have originated on the west side of the Sierra Nevada. They had traveled into the area by means of the Fresno Flats Trail, to take in the hot waters and to gather basket-making plant materials, as well as seeds, pine nuts, and piagi. Olive also describes a later occasion when she and her husband employed a Paiute woman from Whisky Creek to help with the housework (Reed, 1982:64–66). Mrs. Barker's description of early 20th century American Indian activities in and around the Mammoth area illustrate that traditional practices, including travel and sharing of resource areas, seem to have continued into the 20th century. It also illustrates that the Paiute community adapted to the new conditions brought about by Euro-American settlement in the area by taking on new occupations.

3.6.3.5 Historic-Era Context

Exploration and Mining

Early exploration of the area can be dated to the 1830s. While the western Great Basin was initially explored by Jedediah Smith's party in 1826–1827 and Ogden's party in 1829 and 1830, it was not until the Walker party (ca. 1833–1834) that Euro-Americans entered the area around Bridgeport (Elliott, 1983). While there are accounts of members of Smith's party prospecting near Mono Lake and finding promising ore deposits (Wedertz, 2001:13) the area was of little interest to prospectors until new discoveries of gold in the Comstock Lode to the north drew miners from the Mother Lode along the western slope of the Sierra Nevada. Soon miners ventured south in search of new areas to mine.

Gold was discovered in placer deposits south of Bridgeport at Dogtown and by 1857, as many as 100 men were working these placer deposits. During the spring of 1859, richer placer deposits were discovered at Mono Gulch. This discovery prompted another rush of miners into the area. Discoveries at Aurora, in what is now Mineral County, Nevada, and later in Bodie meant that the area around Mammoth remained quiet. Instead, this area was only peripherally exploited in the support of larger mining operations to the north.

In June of 1877, the Lake Mining District was formed when a gold mining claim, the Alpha, was staked on the slope of Mineral Hill (now called Red Mountain). Subsequent claims soon followed. In 1878 most of these claims were purchased by the Mammoth Mining Company. The company, which had been formed by a group of San Francisco investors, established a headquarters, mill, and a small settlement and by the late 1870s, four other camps had been founded to support the mining district activities. The new settlements were named Mineral Park, Mill City, Mammoth City, and Pine City. Mining within the district ebbed and flowed through the 1890s, but production was never great. As a consequence of the rush to the Lake District and establishment of the three supporting towns several toll roads were established. These roads connected the area to Bishop, Bridgeport, Bodie, and Fresno. The toll roads were used to bring supplies and people into the area and were ultimately responsible for the establishment of settlement at Mammoth Camp and Old Mammoth. These roads were later used in the 1900s to bring settlers and adventurers to the area.

Settlement

As early as 1893, a camp was established in the area that would become Old Mammoth. At the time this camp was known as Mineral Park. Later in the early 1900s Charles F. Wildasinn homesteaded 160 ac. in the meadows by Mammoth Creek. On this land Mr. Wildasinn built a small hotel, a store, a saw mill, and a log cabin to live in. The hotel accommodated guests during the summer months from ca. 1908–1911. By 1917, Charlie Summers had purchased all of Wildasinn's holdings except for his cabin. The Summers family took over running the store and hotel. By 1918, they built a new hotel and boarding house for guests and workers. It is about this time that the area was established as Mammoth Camp. The growing popularity of automobile use brought improvements to the store. Roads were also improved and by 1923 Mammoth Camp was a regular stop on the Bishop-Mono Lake Auto Stage Line. The use of the automobile also allowed for regular mail service to Mammoth Camp. Again the store functioned as a post office with Lloyd Summers (Charlie Summers' son) being the first postmaster. Also during this time the area became known as Old Mammoth. The town supported several hotels, a bakery, a multitude of cabins, and a gas station. In the winter of 1927 most of Mammoth Camp was destroyed in a fire; however the area remained a popular place for recreation and continued to develop. Subsequent development of the area included completion of State Highway 203 north of Old Mammoth in 1937. The new highway bypassed Old Mammoth and as a result many businesses moved to be on the highway. As a result, by 1938, Mammoth Lakes was established. Mammoth Lakes remained a small community until the late 1940s when skiing became popular. Large scale recreational use of the area did not begin until the 1960s.

Industry

In addition to mining, two economic pursuits factor prominently within the area. These are logging and recreation. Several lumber mills were established in the area to support mining and town development. In addition, a large lumber operation was established at Mono Mills, near Mono Craters. During the mining boom three mills supplied lumber to mines in the Lake District. All three mills were near the mining camps and include the Rawson Mill, the Sherwin Shake and Shingle Mill, and the Mammoth Steam Sawmill Company. The latter of the three was located at Mineral Park. These mills utilized lumber which was cut in the area between Mammoth Creek and the bluffs overlooking Windy Flat (Reed, 1982:58).

Closer to the APE, the Wildasinn Mill operated after the mining boom. In 1908, the mill was sold to the Home Lumber Company. Home Lumber moved the mill north of the current location of Shady Rest Campground. In order to supply water to the mill in its new location a ditch was constructed to bring water from mammoth Creek. Home Lumber Company sold the mill in 1920 to the Mr. Fred M. Hess and Arthur W. Hess of Bishop. The mill remained in the same location, but was improved and timber north of the property was logged. Approximately 20 men were employed at mill. Finished lumber was shipped to Mammoth and surrounding areas. In 1929, the mill buildings burnt down, but were rebuilt and production continued. In that same year, Fred passed away. The next year, Arthur sold the mill, which was dismantled.

Almost from the turn of the 20th century, recreational activities were a focus of the Mammoth Lakes area. Camping was frequently an extended affair with families packing up the car, or two, with large amounts of gear. With the building of the Wildness Hotel individuals and families had places to stay besides camps and cabins. The hotel was described as a resort where people could go fishing and hiking. With the increased popularity of the automobile and road improvements, several resorts and guide services began to operate at Lake Mary, Lake George, and many other lakes in the Lake Basin.

In addition to recreational activities, the numerous hot springs were frequently visited. The Casa Diablo Hot Springs was the site of one such resort. In the early 1900s, Charlie Summers bought 40 acres near the spring (Reed, 1982:106), and developed this parcel and constructed a trading post, service garage, gas pump, and diner with a dance floor. He provided supplies, gas, food, auto repairs, and an occasional good time (on the dance floor). Summers constructed several wooden bath houses on the hill side in back of the diner, below the geyser that was created after a failed attempt to access hot spring water. It is unclear how long the bath houses remained in existence, but the trading post was razed in the 1950s (Reed, 1982: 108).

3.6.3.6 Previous Studies

Prior to archaeological survey, MACTEC conducted a literature and records search for a one-mile radius area to determine the type and nature of previously-conducted cultural resources work (MACTEC, 2012). A records search was conducted at the U.S. Forest Service office in Bishop on March 17, 2010. Additional research was conducted by the Eastern Information Center of the California Historical Resources Information System at the Department of Anthropology at the University of California, Riverside on July 8, 2010.

The results of the search identified 67 cultural resources studies that have been completed within one mile of the APE. The reports were completed between 1964 and 2007 and identified 232 cultural resources that are, for the most part, prehistoric lithic scatters and historic-period artifact concentrations. Four sites have been recorded within or immediately adjacent to the APE.

3.6.3.7 Recent Surveys and Summary of Resources

MACTEC's (2012) technical report "A Class III Cultural Resources Inventory for the Basalt Canyon Project, Mono County, California" details the results of their pedestrian survey within the APE as understood at the time of their investigation. MACTEC (2011) identified 20 archaeological sites and 42 isolate artifacts or features.

MACTEC identified ten prehistoric sites that vary from simple lithic scatters to complex assemblages of tools, debitage, and features. All prehistoric sites are associated with the exploitation of the Casa Diablo obsidian source and local subsistence resources. These sites must be considered within the framework of the as-yet-defined Long Valley Caldera National Register district. The sites were recorded on Department of Parks and Recreation 523 forms. Previously recorded sites maintained a state-designated trinomial number or an INF number. Newly recorded sites were assigned a temporary designation. In addition, 22 prehistoric isolates consisting of bedrock milling stations with lithic debitage, milling stone with lithic debitage, and small lithic scatters were identified.

MACTEC also identified five historic-period archaeological sites. Three sites are artifact concentrations representing dumping of household refuse and recreational use of the area. Two sites are more complex with features and privies. These sites may be associated with the lumber industry and recreational activities. There are also several sites with prospects, all of which are mechanical; it is likely that the prospects are related to ongoing geothermal development of the area. Sixteen historic-period isolates were also identified that include sparse artifact scatters and a prospect pit.

Five sites were identified that contain both prehistoric and historic-period components. These sites include combinations of lithic scatters and quarries; historic refuse concentrations and habitation; and remnants of mining and logging activities. MACTEC also identified four multi-component isolates of indeterminate age.

BLM archeologists initiated additional survey within a revised APE in June 2012, and documented 13 isolated cultural resources and 25 archaeological sites. All isolates and 17 of the archaeological sites were previously unrecorded, including 8 historic-period sites, 8 prehistoric sites, and a site with both prehistoric and historic-period components (Haverstock, 2012). BLM surveyors also noted discrepancies between previously recorded sites and re-identified resources.

3.6.4 Paleontological Resources

3.6.4.1 Introduction to Paleontological Resources

Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Fossils are considered nonrenewable resources because the organisms they represent no longer exist.

3.6.4.2 Regulatory Setting for Paleontological Resources

The management and preservation of paleontological resources on public lands are governed under various laws, regulations, and standards. For the past several decades, the National Forest System has used the Federal Land Management and Policy Act (FLMPA) as the legislative foundation for its paleontological resource management policies. The National Forest System has also developed general procedural guidelines for the inventory and management of paleontological resources (USFS, 2005). Paleontological resource management objectives include the evaluation, management, protection, and location of fossils on USFS-managed lands. Management policy also includes measures to ensure that proposed land-use projects do not inadvertently damage or destroy scientifically significant paleontological resources.

Federal Land Management and Policy Act

FLMPA defines significant fossils as: unique, rare or particularly well-preserved; an unusual assemblage of common fossils; being of high scientific interest; or providing important new data concerning [1] evolutionary trends, [2] development of biological communities, [3] interaction between or among organisms, [4] unusual or spectacular circumstances in the history of life, [5] or anatomical structure.

Paleontological Resources Preservation Act

The Paleontological Resources Preservation Act (PRPA), Title VI, Subtitle D of the Omnibus Public Lands Act (2009) directs the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using “scientific principles and expertise.” The

PRPA incorporates most of the recommendations of the report of the Secretary of the Interior entitled "Assessment of Fossil Management on Federal and Indian Lands" (USDOI, 2000) in order to formulate a consistent paleontological resources management framework. In passing the PRPA, Congress officially recognized the scientific importance of paleontological resources on some federal lands by declaring that fossils from these lands are federal property that must be preserved and protected. The PRPA codifies existing policies of the BLM, NPS, USFS, Bureau of Reclamation, and USFWS, and provides the following:

1. criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from federal lands;

2. minimum requirements for paleontological resource-use permit issuance (terms, conditions, and qualifications of applicants);

3. definitions for "paleontological resources" and "casual collecting"; and

4. requirements for curation of federal fossils in approved repositories.

Federal legislative protections for scientifically significant fossils apply to projects that take place on federal lands (with certain exceptions such as the U.S. Department of Defense), involve federal funding, require a federal permit, or involve crossing state lines. Because the CD-IV Project site is partially located on USFS-managed lands, federal protections for paleontological resources apply under NEPA and FLPMA.

3.6.4.3 Affected Environment for Paleontological Resources

Paleontological Resources Setting

The study area associated with paleontological resources consists of all ground disturbance associated with project construction activities. During operation and maintenance activities, it is not anticipated that additional areas would be disturbed because proposed facilities would be already built and any access for maintenance or repairs would occur within previously disturbed soils. In order to establish the paleontological resource potential of subsurface soil and rock, a geologic map of the study area and a paleontological locality search were reviewed (Battaglia et al., 2003; UCMP, 2012). Establishing the geologic units to be disturbed by construction activities and the fossils that have previously been identified within their geographic extents allows for an assessment of their potential to contain fossil resources elsewhere, including the construction disturbance area of the project.

The site is primarily underlain by geologic units of volcanic origin, as well as glacial moraine deposits. In several places east of Highway 395, the project site is underlain by Holocene and Pleistocene age alluvial deposits. The geology of the project site is described in greater detail in Section 3.8 and is shown on Figure 3.8-2. A paleontological resource locality records review was conducted using the University of California Museum of Paleontology collection database to identify any fossil occurrences within Mono County. According to the collections search there are only five fossil localities within Mono County, two of which are vertebrate fossils (the other three are invertebrates) (UCMP, 2012). None of the localities are in vicinity of the project area. The vertebrate fossil localities are located east of Mono Lake, over 20 miles north of the project area. All of the fossils were located within Pliocene or older sedimentary units (i.e., older than 1.8 million years). There are no Pliocene or older sedimentary units underlying the project area.

Given the rare and isolated occurrences of fossils within Mono County and the nature of the rocks in the project area, the probability of encountering paleontological resources is very low. Individual geologic units are shown on Figure 3.8-2 (unit symbols in italics are their map unit identification) and their paleontological classifications are given below:

1. **Holocene-age alluvium (*Qal*):** These geologic units are surficial deposits of silt, sand and gravel that have shed relatively recently off of the surrounding mountains. Holocene alluvium underlies and is part of the active flood plain or stream corridor of Hot Creek and Mammoth Creek. These deposits are too young to contain in-situ fossilized remains. None of the fossil records within Mono County are located within this unit. Accordingly the paleontological resource potential is low and the FYPC Class is 1.

2. **Older Pleistocene-age Alluvium (*Qoa*):** These deposits are similar in composition and origin as Holocene alluvium but are older in age. None of the fossil records within Mono County are located within this unit, although elsewhere in California, significant fossil localities have been discovered within Pleistocene alluvium. Accordingly, the paleontological resource potential is high and the FYPC Class is 3.

3. **Glacial till (*Qcd*):** Glacial tills were deposited along the path of former glaciers that extended out of the High Sierra, and often contain cobble- and boulder-sized material chaotically mixed within a mass of sand, silt and clay. The high energy depositional environment of this unit makes preservation of fossil an extremely rare occurrence. None of the fossil records within Mono County are located within this unit. Accordingly the paleontological resource potential is low and the FYPC Class is 1.

4. **Basalt flows (*Qab, Qpb*):** Igneous and metamorphic geologic units that are not likely to contain recognizable fossil remains. Basalt flows originate as lava and would not preserve the remains of ancient organisms. Accordingly the paleontological resource potential is low and the FYPC Class is 1.

5. **Rhyolitic volcanic rocks (*Qmrm, Qmr3, Qef, Qet*):** For the same reasons described for basalt flows above, the paleontological resource potential is low and the FYPC Class is 1.

The only geologic unit with the potential to yield yet undiscovered or unknown fossils is the older Pleistocene-age alluvium. This unit underlies proposed well sites 55-32 and 65-32 and the portion of the proposed well pipeline located south of the existing MP-II plant. In all other areas, the potential presence of fossils is negligible or non-existent.

Paleontological Assessment Standards

The potential for discovery of significant paleontological resources is assessed using two different methodologies. For NEPA purposes, the FYPC System is utilized, and for CEQA purposes, the SVP paleontological resource potential categories are assessed.

Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

Potential Fossil Yield Classification System

The National Forest System uses the Fossil Yield Potential Classification (FYPC) system, which classifies geologic units based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mappable level. It is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The FYPC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions.

Paleontological Resource Potential (SVP criteria)

The SVP has established guidelines for the identification, assessment, and mitigation of adverse impacts on nonrenewable paleontological resources (SVP, 1995). Most practicing paleontologists in the nation adhere closely to the SVP’s assessment, mitigation and monitoring requirements as outlined in these guidelines, which were approved through a consensus of professional paleontologists. The SVP outlines criteria for screening the paleontological potential of rock units and established assessment and mitigation procedures tailored to such potential (SVP, 1995). Table 3.6-1 lists the criteria for high-potential, undetermined, and low-potential rock units. In the absence of local guidelines, most cities and counties use SVP guidelines as a basis for assessing the significance of paleontological impacts and mitigation requirements under CEQA.

TABLE 3.6-1
PALEONTOLOGICAL POTENTIAL CRITERIA

Paleontological Potential	Description
High	Geologic units from which vertebrate or significant invertebrate or plant fossils have been recovered. Only invertebrate fossils that provide new information on existing flora or fauna or on the age of a rock unit would be considered significant.
Undetermined	Geologic units for which little to no information is available.
Low	Geologic units that are not known to have produced a substantial body of significant paleontological material.

SOURCE: SVP, 1995.

3.7 Geothermal and Groundwater Resources

This section describes the geothermal resources in the Project Action area and vicinity, including an overview of the geologic setting as related to the current understanding of the geothermal system, a history of the exploration and development of the geothermal resources, a discussion of the on-going geothermal monitoring data, and the relationship of the geothermal system to both shallow groundwater, surface waters, and surface manifestations. The information presented in this setting is based on a comprehensive literature review of the available studies and monitoring data related to geothermal resource development in the Casa Diablo vicinity detailed in *Geologic Overview of Long Valley Caldera – Potential Environmental Impacts* (EGS, 2012), included as Appendix D.

3.7.1 Environmental Setting

3.7.1.1 Geothermal Resources General Background

Geothermal energy is the natural heat of the earth that, if conveyed by water and depending on temperature, can be used in a range of applications including power generation. Globally, about 10,715 megawatts (MW) of geothermal power is generated in 24 countries. Geothermal resources in the US are typically located in active tectonic or volcanic areas in the western US. In California, there are currently 18 authorized known geothermal resource areas (KGRAs), 46 operating geothermal plants, and 14 geothermal resources with temperatures over approximately 298^{o}F (148^{o}C). California has a combined total installed geothermal electrical nameplate generation capacity of 2,516 MW (California Energy Commission, 2012). The largest producing system is the steam-dominated Geysers with 1517 MW of active installed capacity. Power generation from water-dominated geothermal systems in the eastern Sierra include 270 MWe at Coso, CA (north of Ridgecrest), 90 MWe from Steamboat Springs (south of Reno, NV), and 40 MWe from Casa Diablo within the Action area. More efficient generating plants and gathering systems and improved resource management strategies, primarily through injecting the produced fluids or augmenting injection, have increased the life-span and electrical generating capacity of many geothermal resources.

Geothermal electrical generation from conventional hydrothermal systems requires a relatively shallow young active heat source (such as a magmatic intrusion less than 1 million years old or shallow high heat from crustal thinning), highly permeable rocks, and convectively circulating water at temperatures above approximately 266 ^{o}F (130^{o}C) at economically accessible depths (currently less than 10,000 ft or 3,048m). These unique conditions occur primarily around present day volcanic areas or tectonic regions at the active margins of the earth's crustal plates. In a conventional geothermal resource, cold water recharge penetrates through faults and fractures in the earth's crust. Cold water is then heated by geothermal heat in areas of active tectonism and/or recent volcanism that heats the water at depth. Hot water is less dense than cold, and rises in permeable zones in the overlying rock units. Eventually, the heated water cools, increases in density, and descends to be heated again producing the requisite hydrothermal convection.

Mineral deposition or overlying impermeable rocks can form a barrier or cap limiting the vertical circulation of hot water and maintaining convective fluid flow in a permeable geothermal reservoir at depth. Most permeability barriers are imperfect or can be broken by the active tectonic processes responsible for the development of a geothermal system. Comparatively small amounts of water and/ or gas leak to the surface along fractures and faults and show up as hot springs or steam vents (fumaroles) at the surface.

A hydrothermal system which is (or may be) capable of supporting geothermal energy development is termed a *geothermal resource* or a *geothermal system*. Geothermal resources vary in size, temperature, permeability and chemistry depending primarily on the geologic setting and the rocks that make up a geothermal reservoir. Based on reservoir fluids, geothermal systems occur as either water-dominated or steam-dominated resources. Steam dominated systems like The Geysers north of San Francisco, CA are rare but have the advantage of using the steam to directly power a turbine generator. Water dominated systems like Long Valley KGRA (which includes Casa Diablo) are more common and require that either a portion of the geothermal fluid be flashed to steam, or the geothermal fluid can be used to heat and vaporize a low vapor pressure secondary working fluid. Either the produced steam (flash steam systems) or the working fluid (binary systems) vapor can then be used to power a turbine for electricity generation. At Casa Diablo, turbines are powered by a secondary working fluid vaporized through heat exchanged with geothermal fluid (binary system).

3.7.1.2 Overview of the Long Valley Geothermal Resource

Geology

The USGS designated the Mono-Long Valley region as a KGRA in the 1970s because of geologic features and widespread hot springs and fumaroles over a 45 square mile area that provided ample evidence of a viable magmatic heat source for a geothermal system. The prominent geologic feature of the KGRA is the Long Valley Caldera, a topographic depression approximately 11 by 22 miles (17 by 35 km) that was created by the eruption of an estimated 143.9 cubic miles (600 cubic km) of material known as the Bishop Tuff approximately 760,000 years ago. The caldera-forming Bishop Tuff eruption partially evacuated the underlying magma chamber and the floor of the caldera collapsed along semicircular systems of ring fractures that define the structural margin of the caldera (Figure 3.7-1). Bishop Tuff filled the caldera depression and forms the deeper portion of the potential geothermal reservoir within the caldera. A resurgence of eruptions have continued to fill the caldera over the last 600,000 years with a series of rhyolite flows and tuffs (a formation known as Early Rhyolite), centered largely around the Resurgent Dome, which elevates this area within the caldera forming a “moat” between the Resurgent Dome and the caldera boundary. The current hydrothermal system, located in the south central portion of the caldera is probably less than 40,000 years old. As shown on Figure 3.7-1 the Project Area is located in the western caldera moat on the west flank of the Resurgent Dome. Most of the outflow (roughly 70 percent) of the current hydrothermal system occurs at Hot Creek along the southeastern edge of the Resurgent Dome.

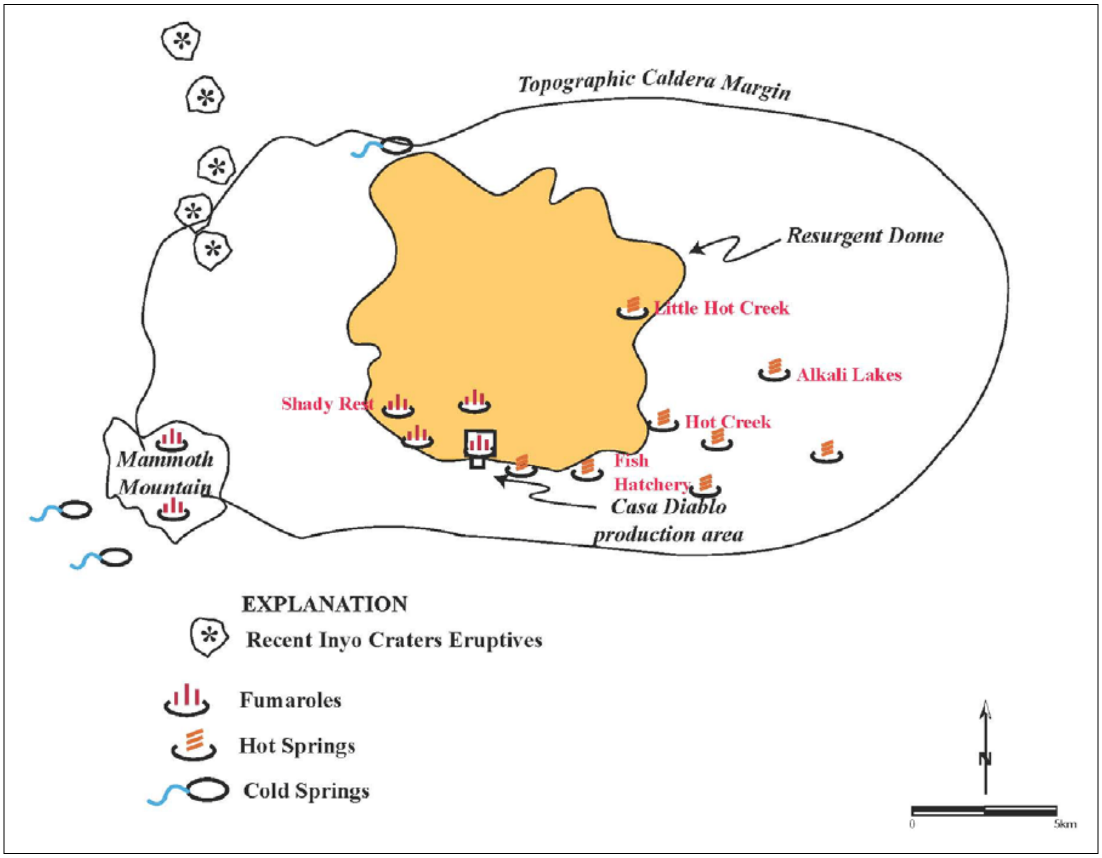
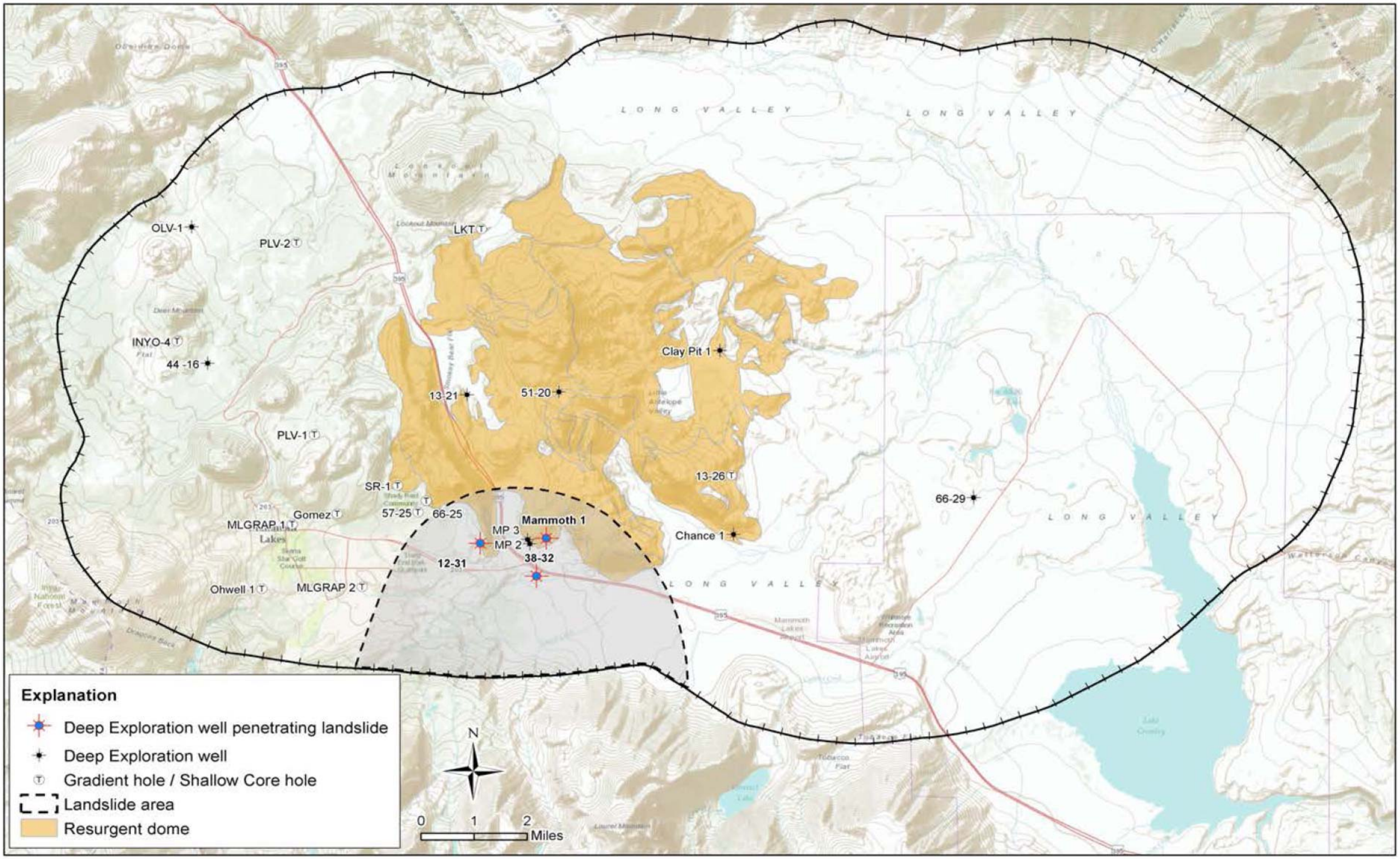


Figure reproduced from Suemnicht (2010)

Figure 3.7-1
Topographic Caldera Margin, Resurgent Dome, Casa Diablo, and Hot Creek Outflow Area

Numerous boreholes drilled within the Resurgent Dome and the geothermal field have helped define the stratigraphy. In order of increasing depth, the lithological column consists of Alluvium and Glacial Till, Moat Basalt, Early Rhyolite, Metasedimentary Landslide Block, Bishop Tuff and either Paleozoic metasedimentary basement or Sierran intrusives. The low-permeability metasedimentary Landslide Block is of limited spatial extent, and is located in the central part of the southern caldera moat (Figure 3.7-2).

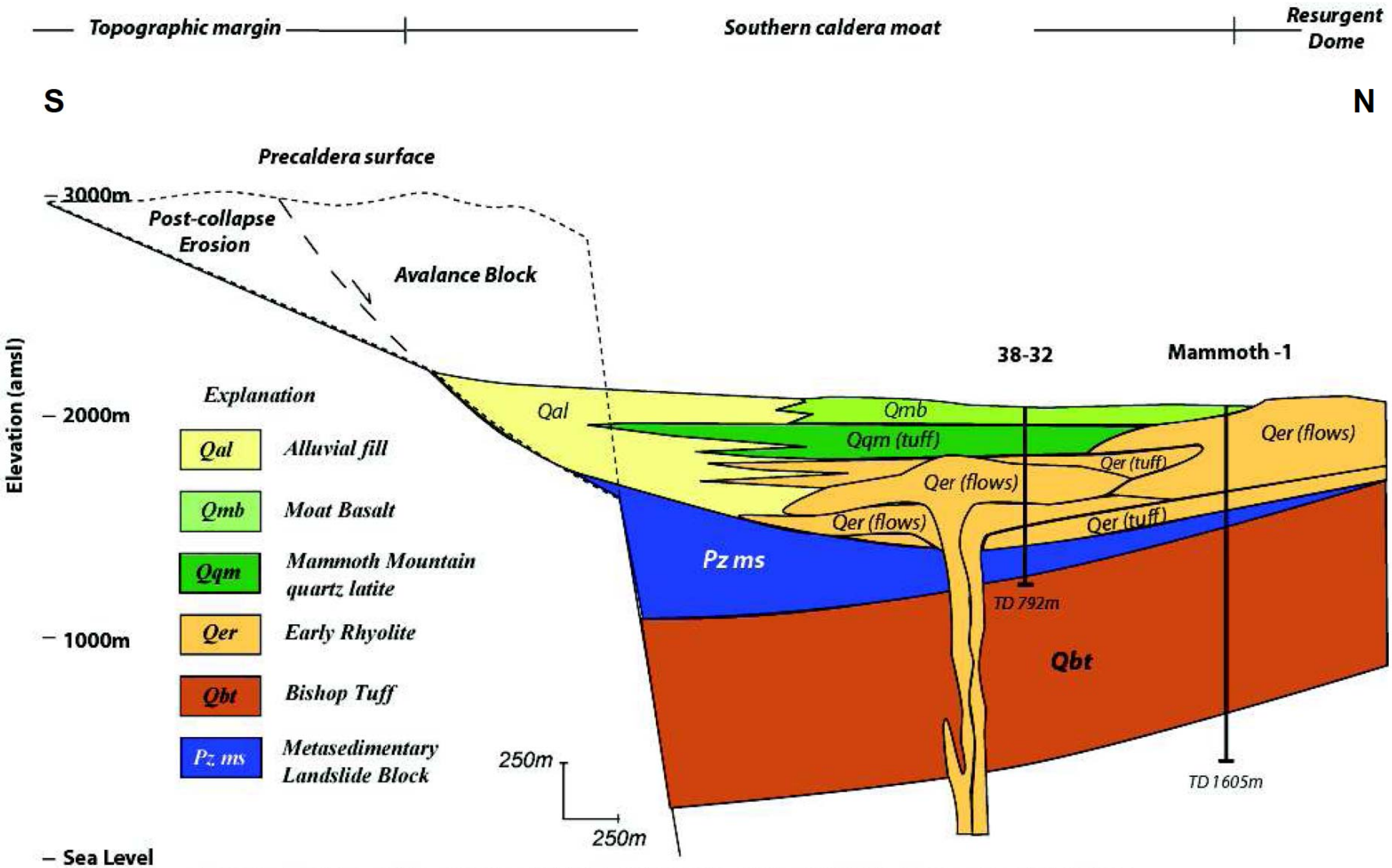
Existing geothermal wells at Casa Diablo produce moderate temperature fluids from a comparatively shallow section of fractured Early Rhyolite, which represents the outflow of the geothermal system. Drilling results and monitoring records indicate the shallow Early Rhyolite reservoir at Casa Diablo and west up to Shady Rest (Basalt Canyon Well 12-31) is stratigraphically separated from the underlying Bishop Tuff by the low-permeability Paleozoic Landslide Block (Figure 3.7-3). The landslide block controls the vertical distribution of shallow hydrothermal circulation in the southern caldera by isolating the warm shallow outflow at the Casa Diablo production area from deeper or lateral cold natural recharge from the caldera margin and injection fluids that might cool the system. Elsewhere within the caldera, cold recharging waters from the caldera rim penetrate the deeper fractured Bishop Tuff causing sharp temperature



SOURCE: EGS, 2012

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.7-2
Distribution of the Landslide Block of Metasedimentary Rocks from the Southern Rim of Long Valley Caldera



Structural cross-section of southern caldera showing the landslide block encountered in exploration corehole 38-32 and the Mammoth-1 deep test well at Casa Diablo. (after R.A. Bailey 1992)

SOURCE: EGS, 2012

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.7-3
Structural cross-section showing the landslide block

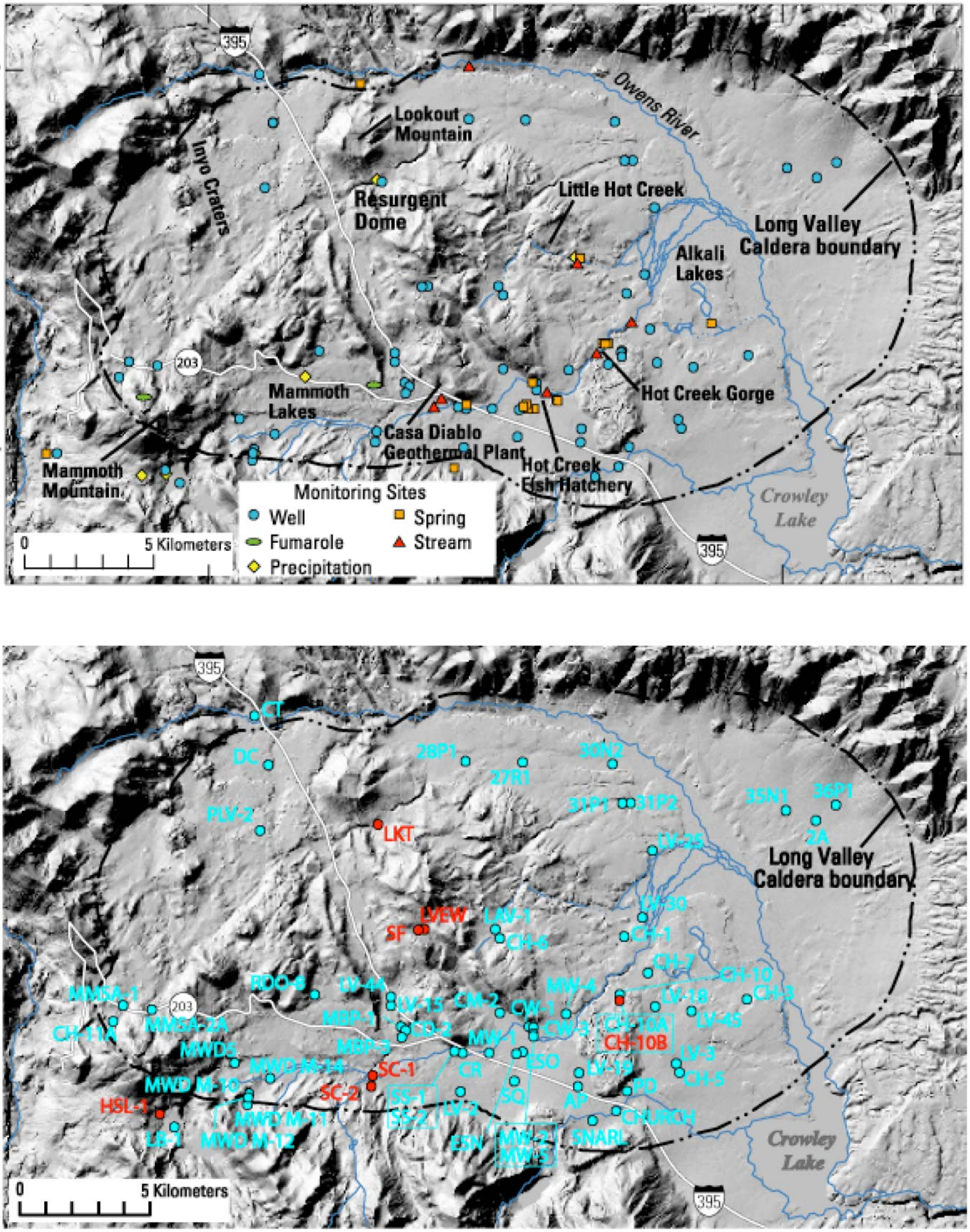
declines along the structural caldera margins. This shallow geothermal zone is separated from shallower cold groundwater aquifers in the unconformably overlying sediments to the west in Basalt Canyon by altered sections of the upper Early Rhyolite. These sections of the upper Early Rhyolite have been altered to low permeability clay and volcanic clays. East of Casa Diablo, the overlying sediments thin and hot water reaches the surface along faults and fractures, and mixes with surface and shallow cold groundwater in hot springs and related surface manifestations.

Basalt Canyon wells, approximately 1.2 miles (2 km) west of Casa Diablo, produce from fractured geothermal reservoir within the lower section of Early Rhyolite and the upper section of Bishop Tuff. The reservoir at Basalt Canyon is deeper and closer to the upflow of the system than the Early Rhyolite production at Casa Diablo. After produced geothermal fluids pass through the power plant and lose heat, the fluids are currently injected below the production zone and into the Bishop Tuff near Casa Diablo. Additional fluids from the proposed project expansion will be injected into deeper wells completed within the Bishop Tuff (almost 2000 ft or greater than 600 m), near Casa Diablo and in wells in Basalt Canyon completed in both the Early Rhyolite and the Bishop Tuff.

Differences in geology, chemistry and temperature in Basalt Canyon and Casa Diablo production and injection wells illustrate the complexity of interactions within the principal geothermal outflow reservoir at Casa Diablo and the upflow in the western caldera. The present day outflow from the deeper geothermal system occurs along penetrative northwest-southeast faults related to the Resurgent Dome and east-west ring fracture faults that control the southern structural margin of the caldera. Active and relict fumaroles (steam), mudpots and hot springs (hot water) are generally localized along faults that deform the caldera (see Section 3.8, Geology, Soils, and Seismicity). For example, fumaroles at Casa Diablo are distributed along a major northwest trending normal fault system that forms a graben (valley formed by two down-dropped faults) within the Resurgent Dome. Hydrothermal alteration marks the trace of a fault that cuts 600,000 year-old Early Rhyolite of the Resurgent Dome on the northeastern side of the Mono-Long Valley volcanic field. After the formation of the caldera, lavas flooded the southwestern caldera moat and lapped against the Resurgent Dome. Active fumaroles on the western side of the geothermal field are aligned along a fault scarp that uplifts and exposes these younger (129,000-62,000 year-old) post-caldera moat basalts (EGS, 2012).

Geothermal Features in Long Valley Caldera

The geothermal features of the Long Valley Caldera have been studied for more than four decades, initially for geothermal exploration and later as part of volcanic hazards monitoring or for cooperative hydrologic monitoring of geothermal development through the Long Valley Hydrologic Advisory Committee (LVHAC). As shown on Figure 3.7-4, the United States Geological Survey (USGS) hydrologic monitoring system in Long Valley includes wells, fumaroles, hot springs and streams. These features have been monitored for various indicators of the geothermal reservoir such as temperature, pressure, flow rate, chemistry and water level.



SOURCE: USGS, 2012

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.7-4
USGS Hydrologic Monitoring Points in Long Valley

Hot Creek Springs

Springs in Hot Creek Gorge discharge water at temperatures near boiling (199ºF or 93ºC) into Hot Creek along a fault-bounded 0.4 mi (0.6 km) section of the creek that represents the primary discharge location for thermal water flowing into the Casa Diablo outflow zone. The closest observation well to the gorge is well CH10B, which is approximately 1,600 ft (500 m) southeast of the main set of hot springs. A temperature maximum of 110ºC (230 ºF) occurs at a depth of 130 ft (40 m) in this well and sampled well fluids are chemically identical to hot spring waters in the gorge (Farrar, et al., 1995). Concentrations and ratios of thermal elements boron and chloride in the gorge spring waters and in well CH10B are similar to those in production fluids at Casa Diablo. These observations are consistent with thermal water in and adjacent to the gorge being part of the thermal outflow zone from Casa Diablo, which is mixed with cold groundwater.

Hot Creek Springs is localized along two north-striking faults that form a small graben (valley formed by two down-dropping faults) that contains the Hot Creek Geologic Site. Numerous earthquakes that have occurred during caldera unrest that began in 1980 commonly affect the flow of the springs. Additional boiling springs developed or were reinvigorated in May 2006.

Long term monitoring suggests that there were no significant changes in spring discharge (total mass) at Hot Creek or in downhole pressures in nearby monitoring wells (CH10B) during the period when pressures in the geothermal reservoir at Casa Diablo declined (corresponding to an increase in production of geothermal fluid in the Casa Diablo area. Slight increases in Hot Creek spring discharges and pressure increases in adjacent cold-water aquifers appear to have occurred in response to above-normal precipitation during the 1995-2001 period. Changes in Hot Creek temperature, boiling, and flow have been correlated to changes in seismicity and precipitation, but not with changes in the geothermal reservoir.

Little Hot Creek

Approximately 2 miles (3 km) north of Hot Creek are a group of hot springs near the head of Little Hot Creek where maximum temperatures are near 175ºF (80ºC). Periodic flow measurement and chemical sampling have occurred at Little Hot Creek as part of the LVHAC monitoring system. The average total spring flow from this area was about 0.35 cfs (10 L/s). During the 1980s, total spring discharge varied with earthquakes of M>4-5 in the Long Valley region, similar to other springs in the eastern caldera. Little Hot Creek and other thermal springs and observation wells located between Hot Creek and Lake Crowley indicate a continuation of the zone of thermal outflow originating at Casa Diablo, with ultimate discharge occurring as seepage into the lake. Because the thermal and non-thermal ground water aquifers tend to merge near the surface in this high-water table area, the thermal water is cooler and more dilute than that discharging into Hot Creek gorge.

Hot Bubbling Pool

The Hot Bubbling Pool is approximately 3.1 miles (5 km) east of Casa Diablo. The feature experienced an approximately 4 foot (1.2 m) water level decline with the onset of expanded production and deeper injection in 1991 but water levels have recovered as geothermal production has shifted west to Basalt Canyon. This area is one of the thermal springs closest to Casa Diablo.

Hot Bubbling Pool is located about 200 ft (60 m) northwest of well CW-3. The pattern of water-level change in CW-3 (and Hot Bubbling Pool) consists of a nearly constant level from 1988 through 1990, a period of declining water level from 1991 through 1994, and a period of increasing water level from 1995-2001 followed by more decline from 2001 to present. These changes reflect both the change in production in the Casa Diablo geothermal production area in 1991, and the onset of above-normal precipitation and groundwater recharge from 1995-2001. Clearly identifiable seasonal variations in CW-3 show winter lows and summer highs and are most likely in response to similar variations in head in the shallow groundwater system.

Hot Creek Fish Hatchery

The California Department of Fish and Game fish hatchery is located immediately to the east of Hot Bubbling Pool and accounts for an estimated 2 to 5 percent of Long Valley Caldera’s total thermal outflow. The thermal water contribution raises water temperatures an average of 9°F (5^{o}C) above background, which supports fish spawning. Fish from the hatchery are planted in many surrounding Sierra lakes and streams and are an important part of regional recreation and the local tourist industry. Estimates of thermal water discharge are based on a proprietary model using changes in water levels and pressures from thermal monitoring wells located near the fish hatchery. While the modeled thermal water discharge decreased in 1991 in response to a major increase in geothermal production, it varied over the entire monitoring period with precipitation; therefore, the variations in the shallow temperature and flow at the fish hatchery springs are not solely attributable to variations in the geothermal reservoir pressure. Seasonal and annual climate and hydrologic cycles affect both the non-thermal and thermal water discharge from the Fish Hatchery springs. Thermal water output closely matches seasonal or annual variations in cold water flow.

Thermal Ground

Thermal ground occurs in several locations in the southern caldera moat related to active or reactivated fumaroles or older broad altered zones of nutrient-poor clay-rich soils. Surface manifestations and areas of thermal ground have varied considerably during the period of caldera unrest and geothermal development. Several relict mudpots and fumaroles at Casa Diablo became active after the earthquake swarms of the 1980’s and as production increased in 1991. Some of the reactivated springs or fumaroles occur at considerable distances or at higher elevations along major controlling fault zones around Casa Diablo and further west in the caldera moat. In part, the increased steam output is related to shallow reservoir pressure declines and steam migration from the shallow heated groundwater system. Several liquid hot springs at Casa Diablo converted to steam vents accompanied by increases in ground temperature within the field during 1991-1993. Changes in fumaroles, high carbon dioxide (CO_2) gas flow and tree deaths at Horseshoe Lake and the flanks of Mammoth Mountain were associated with an apparent response to potential magmatic input around Mammoth Mountain after 1990. The rapid onset of dying trees was apparently related to CO_2 interfering with nutrient uptake through the tree roots (EGS, 2012).

Geochemistry

The chemistry of a hydrothermal system reflects the source of the thermal water and the path it takes through permeable rocks as the water is heated, cooled (conductively or by mixing) and eventually reheated in the geothermal system. Interaction between the water and rock changes the chemistry of both depending on temperature, water-rock ratio, and the original chemistry of each part of the system. Hydrothermal circulation alters the rocks that water circulates through, as well as the water, resulting in a chemical signature for the water that allows an evaluation of the thermal water source and the processes affecting the water as it makes its way to the surface. Complete evaluation of fluid chemistry and reservoir interaction typically requires sampling the deep geothermal fluids, surface manifestations and local cold water recharge to determine all of the interactions that affect the system. Recent geochemical data includes analytical results from producing geothermal wells, isotopic studies to determine potential hydrologic interactions within the caldera, and gas analyses to evaluate changes related to potential magma intrusion and caldera unrest (EGS, 2012).

Long-term flow measurements and mass-flux estimates based on element concentrations, such as boron and chloride, indicate that the total thermal water flow through the hydrothermal system, prior to the 1985 onset of geothermal production, was at 13 cubic feet per second (cfs) [(5,900 gallons per minute (gpm)]. Of this total flow, as much as 8.8 cfs (3900 gpm) or roughly 70 percent of the hydrothermal outflow occurs at Hot Creek on the southeastern edge of the Resurgent Dome (Figure 3.7-1). The median flow of thermal springs in Hot Creek Gorge has remained at 8.75 cfs since the beginning of hydrothermal monitoring in 1988 through 2012. The remainder of the outflow occurs at other springs and further east[1].

Geochemical estimates of source reservoir temperatures range from 392 to 536 °F (200°C to 280 °C) (Sorey, 1991). These temperatures are significantly higher than the measured temperatures in the geothermal reservoir in Casa Diablo (as represented by monitoring well MBP-3 at 316.4 °F or 158°C), and the same or slightly higher than and that the geothermal upflow in the west moat (represented by Monitoring Well 44-16 (392 °F or 200ºC). While chloride/boron ratios are similar, chloride concentrations are higher (closer to 300 mg/L) in the higher temperature geothermal upflow area than in the Casa Diablo area (about 230 mg/L). The cooler geothermometer temperatures and more dilute character of thermal waters at Casa Diablo is consistent with the hydrogeological model of Casa Diablo as the outflow zone of the geothermal system which has been cooled by conduction and mixing with cold water.

Surface Water and Shallow Groundwater

Surface water features are discussed in Section 3.19, *Surface Water Hydrology*, but relevant portions are briefly discussed here because of the interactions between surface water and shallow groundwater and the interplay of these waters with the geothermal system.

1 Michael Sorey, 1991, "new Evidence on the Hydrothermal System in Long Valley Caldera from Wells, Fluid Sampling, Electrical Geophysics and Age Determinations of Hot Spring Deposits", Journal of Volcanology and Geothermal Research, V48 (1991), pp 229-263.

Surface water in the vicinity of the Project area (Upper Basalt Canyon, Basalt Canyon, and Casa Diablo area) consists primarily of ephemeral streams. Snow melt from the surrounding Sierra Nevada is the principal source of surface water runoff that recharges both the shallow cold groundwater system and deep geothermal system in Long Valley Caldera. Surface and groundwater either follows topography from very high elevation Sierra peaks to the topographic low of Lake Crowley, or through the Dry Creek Basin to Big Spring along the Owens River headwaters. Sources of cold groundwater and geothermal recharge include snow melt infiltration and underflow or subsurface flow in shallow alluvium, glacial tills, and penetrative faults and fractures. Some additional recharge comes from higher elevations of the Glass Mountains complex in the eastern part of the caldera but it is less than the recharge from the western and southern topographic margins of the caldera due to limited precipitation east of the Sierran Range front.

The perennial stream of Mammoth Creek is the principal surface water feature in the Mammoth Groundwater Basin, flowing down from the Mammoth Lakes Basin into the Sierra highlands eastward through the Town of Mammoth Lakes and immediately south of the Project area. Near Hot Creek Fish Hatchery, Mammoth Creek becomes Hot Creek, because natural thermal discharge from springs in and near the creek contribute to the flow.

Thermal and Geothermal Hydrogeology of the Long Valley Caldera

The currently active high temperature geothermal system in Long Valley is the result of upflow in an actively convecting geothermal reservoir in the western caldera with associated outflow along faults and fractures to stratigraphically constrained shallower zones to the east. A conceptual model of the geothermal system indicates that cold water flows downwards along steeply dipping faults on the western margin of the caldera, gets heated at depth, and flows upwards. It then moves laterally towards Casa Diablo to eventually discharge at Hot Creek gorge and east moat. Geochemistry and hydrologic data indicate that a significant portion of the snow melt recharge from the western rim of the caldera penetrates deeply into the factured rocks within the caldera and, at depths of approximately 1.2 miles (2 km), is heated by young shallow magma in the western caldera moat.

Available geologic and geochemical data in Long Valley support a separation between the shallow cold groundwater system, which includes the Mammoth Groundwater Basin, and the underlying high temperature geothermal system in the western caldera moat (EGS, 2012). Drilling results indicate that the shallow cold groundwater system is separated from potential geothermal influence by thick, low permeability sections of altered Early Rhyolite[2], which underlie shallow groundwater aquifers that occur in shallow moat basalt units, glacial outwash gravels, or poorly consolidated alluvium/colluvium in the western caldera (Figure 3.7-3).

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[2] When rock and water interact, the chemical and mineralogic composition of the rock changes or alters. The degree and nature of alteration is variable and depends on both fluid and rock temperatures and chemistry. When rocks are fine grained or otherwise more reactive, the degree of alteration can be greater. When rock is physically and chemically changed or altered by hydrothermal fluids, it can be identified as altered or hydrothermally altered. The permeability of rocks can be reduced by hydrothermal alteration, particularly fine grained volcanic rocks which often alter to clay.

Geochemical analyses (primarily chloride and boron concentrations, as discussed further below) indicate that the chemistry of shallow cold groundwater and deeper geothermal fluids is very different, and therefore, if geothermal fluids were co-mingling with shallow cold groundwater, it would be evidenced by changes in the chemistry of the groundwater. To date, sampling of shallow groundwater wells has shown no chemical evidence of mixing with geothermal water, with the exception of one groundwater well (Well P-17) that showed very low concentrations of chloride which could indicate a very small (1-2 percent) contribution of geothermal fluid. Well P-17 is an isolated well, located the furthest north of the groundwater wells. However, these indications of geothermal fluid influence consist of constituent concentrations so close to the level of accurate reporting of laboratory measurement, that they remain indications rather than conclusive evidence. Therefore, although slightly elevated temperatures have been reported in the northwest part of the Mammoth Groundwater Basin in some groundwater wells[3] and at shallow depths in some geothermal wells, there is no significant chemical evidence in the groundwater wells that these warmer temperatures are related to the upward outflow of deeper geothermal fluid into shallower cold water aquifers. The elevated temperatures could be related to the flow of groundwater through the aquifer rock which has been heated by the high heat flow at the periphery of the geothermal system in the western caldera (EGS, 2012).

Highly permeable and laterally continuous hydrogeologic units over lateral distances of greater than 6.2 miles (10 km) underlie the southeastern part of the caldera. The hydrogeology is poorly defined east of Casa Diablo because fewer wells have been drilled and most do not penetrate as deep as the underlying Bishop Tuff reservoir section. The available well data indicates that warm water outflow in the southern and eastern caldera is predominantly shallow, occurring in permeable Early Rhyolites immediately east of Casa Diablo and is entirely within shallower alluvial or lacustrine (relating to lake-forming deposits) units farther east toward Lake Crowley. Pressure variations in shallow wells 3 to 6.2 miles (5 to 10 km) east of Casa Diablo correlate in time with those in the production reservoir with only minor delays (days to weeks) in the arrivals of the pressure changes induced by changes in the production at Casa Diablo. Geochemical and thermal data from wells and springs in the southeastern caldera between Casa Diablo and Hot Creek gorge corroborate the continuity of thermal fluid flow from Casa Diablo thorough Hot Creek eastward to Lake Crowley and the comingling of shallow geothermal outflow and groundwater systems in the southeastern caldera.

Additional data confirming the lateral connection and the predominantly west to east flow direction was obtained following inadvertent leaks of isobutane into the spent geothermal fluids at the existing Casa Diablo plant around 1993. The spent fluid was pumped into the injection zone (Bishop Tuff) beneath the plant at a depth of approximately 0.4 mile (600 m). The spread of isobutane through the hydrothermal system was traced by collecting gas samples at hot springs and steam vents. Isobutane was detectable in surface features less than 2.5 miles (4 km) away in about 2 years and reached Hot Creek gorge, 5 miles (8 km) away, within 4 years (Evans, et al., 2004).The combination of isobutane migration and reservoir pressure transmission in the

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3 MCWD Wells P-15 through P-20 have temperatures between 9 and 18ºF (5 to 10ºC) above the other groundwater wells, which were typically below 42 ºF (10 ºC) during monitoring between 1995 and 2011.

production zone and injection zones signifies a high degree of lateral continuity within the relatively shallow geothermal system in the south moat.

Light stable isotopes and trace elements have been important in determining the general west-east flow of source waters across the caldera for both the thermal and non-thermal water. Analyses and comparisons of light stable isotopes deuterium (D) and oxygen-18 from Long Valley show that cold groundwater recharge for the shallow glacial till, moat basalt and alluvium/colluvium aquifers of the Mammoth Groundwater Basin originates from snowmelt around Mammoth Mountain or the upper part of Mammoth Creek and from the southern caldera margin. Based on deuterium values, deeper recharge for the hot geothermal water beneath the western caldera is recharged from snowmelt along the northern base of Mammoth Mountain and the upper reaches of Dry Creek. Changes in isotopic values trace geothermal flow from the west moat to the south and east to Casa Diablo and beyond. Some conservative trace elements like boron are unique in geothermal systems and trace element concentration ratios with chloride have been used in Long Valley and other geothermal systems for decades. A nearly constant chloride/boron (Cl/B) ratio of 23 for geothermal waters east and west of Casa Diablo indicate a common hot water source for these geothermal waters and the geothermal reservoir at depth beneath the caldera's west moat.

CO_2 is the principal non-condensable gas in most geothermal systems including Long Valley. In a liquid-saturated system like Long Valley, non-condensable gas is dissolved in the geothermal fluid unless the pressure is released (for example by fluid rising to the surface) as pressure declines, forming a gas-vapor phase. The source of non-condensable gas can be hydrothermal alteration or magmatic discharge, or both. In Long Valley, the source of the non-condensable gases in thermal waters appears to be related to magmatic discharge, based on evaluation of trace gases such as helium and gas isotopic analyses. Non-condensable gases are released in Long Valley through diffuse soils, steam vents, fumaroles, and by dissolving in groundwater. Past changes in the outflow from hot springs and fumaroles and increased CO_2 emissions around the flanks of Mammoth Mountain have been interpreted as potential indicators of magma moving to shallower crustal levels fracturing and releasing gases during dike emplacement in 1989. The gas emissions on Mammoth Mountain have been accompanied by rising helium ratios and carbon isotope ratios, which have been interpreted as potential indicators of magma moving to shallower crustal levels rather than changes in the produced geothermal system. Magma-related gas emissions include increased CO_2 output that has resulted in several areas of tree death around the flanks of Mammoth Mountain and around the Resurgent Dome. Higher than normal CO_2 concentration in the soil kills the trees by denying their roots oxygen (O_2) and by interfering with nutrient uptake.

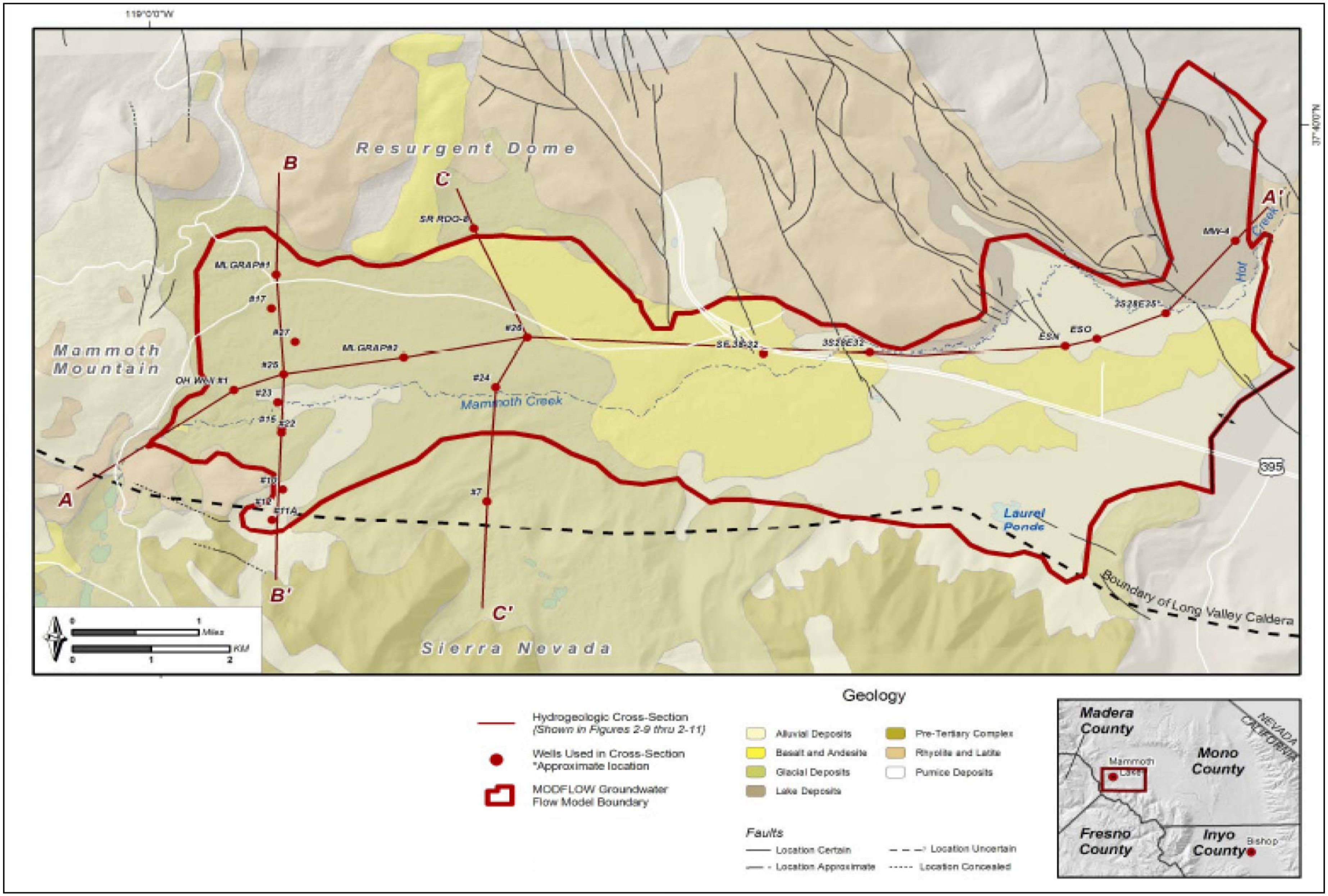
The chemistry of the thermal features collected as part of the LVHAC hydrologic monitoring suggest that the thermal features, such as Hot Creek Spring and Hot Bubbling Pool, are predominantly thermal water with mixtures of groundwater. Combining chloride and temperature data and assuming that the thermal reservoir at Casa Diablo is represented by Well MBP-3 (230 mg/L chloride; 316.4 ^{o}F or 158^{o}C), and that the geothermal upflow is represented by Monitoring Well 44-16 (283 mg/L chloride; 392 ^{o}F or 200ºC), it appears that the Casa Diablo aquifer is approximately 80 percent thermal water.

3.7.1.3 Shallow Groundwater System

The cold groundwater system in the Long Valley caldera is differentiated from the deeper, hotter geothermal system by geologic units, depth to (or elevation of) water level, temperature, and fluid chemistry. Shallow non-thermal water in the Mammoth Groundwater Basin is generally colder (by 12-16 ^{o}F or 7-9 ^{o}C), shallower (25-265m), lower in total dissolved solids (TDS) and constrained to layers within glacial till, moat basalt and/or alluvium/colluviums which overlies the thermal aquifers. Cold groundwater aquifers are separated from the deeper hotter geothermal system by low permeability units of hydrothermally altered Early Rhyolite in the western and south central part of the caldera where the thickness and elevation of the overlying sediments is greatest. This separation is not apparent in the southeastern caldera where geothermal outflow discharges at the surface, and in some cases into shallow groundwaters (e.g. Fish Hatchery Springs) or surface waters (e.g. Hot Creek), as discussed in the sections above.

The Mammoth Community Water District (MCWD) produces water from the Mammoth Groundwater Basin to meet potable water needs of the Mammoth Lakes community. Mammoth Basin groundwater supply wells produce cold groundwater from the hydrologic region drained by the upper reaches of Mammoth Creek. MCWD installed the first production well in 1978, and as of 2011 used 9 production wells (see Section 3.19, *Surface Water Hydrology*). Figure 3.7-5 displays the areal extent of the Mammoth groundwater basin. The water production wells are located in the western part (along Section BB’) of the groundwater basin, and are thus spatially separated from the geothermal wells (all of the existing geothermal wells are located east of Section CC’). Geologic Section AA’ (east of Section CC’) either passes through or lies close to the geothermal production area (Cross-Section A-A’ is shown on Figure 3.7-6).

Monitoring records document no changes in the chemistry of groundwater wells in the Mammoth Groundwater Basin from 1996 to 2009 during continual production of the geothermal system at Casa Diablo. Sorey (2011b) has examined the available fluid chemistry data. Geothermal waters from various wells and surface manifestations display nearly constant ratios of chloride to boron (Cl/B) and chloride to bromide, which indicates a common thermal water source within the caldera. Although a few cold groundwater wells have Cl/B ratios typical of geothermal wells (greater than 20), the absolute Cl, Br and B concentrations in cold groundwaters are very small, the higher Cl/B ratios are in some wells with the lowest Cl and B concentrations, and concentrations are very near the detection limit for laboratory analysis of these elements. Therefore, the Cl/B ratios of groundwaters are not indicative of the origin of the low chloride levels in the cold groundwaters. In addition, chloride concentrations typical of high temperature deep geothermal water (~250 mg/L) were not detected in the shallow groundwater wells of the Mammoth Groundwater Basin with anomalous temperatures. In water samples from only one groundwater monitoring well (P-17) located at the northern end of the groundwater basin, were chloride concentrations reported above 2 mg/L (at concentrations between 2-5 mg/L). This indicates that if the source of the chloride in P-17 is thermal water, the maximum thermal components would be very small (1-2%). Stable isotopic composition of cold groundwater in the Mammoth Basin plot almost exactly on the meteoric water line (Figure 3.7-7), with no suggestion of measureable influence from geothermal fluids (Sorey, 2011b).

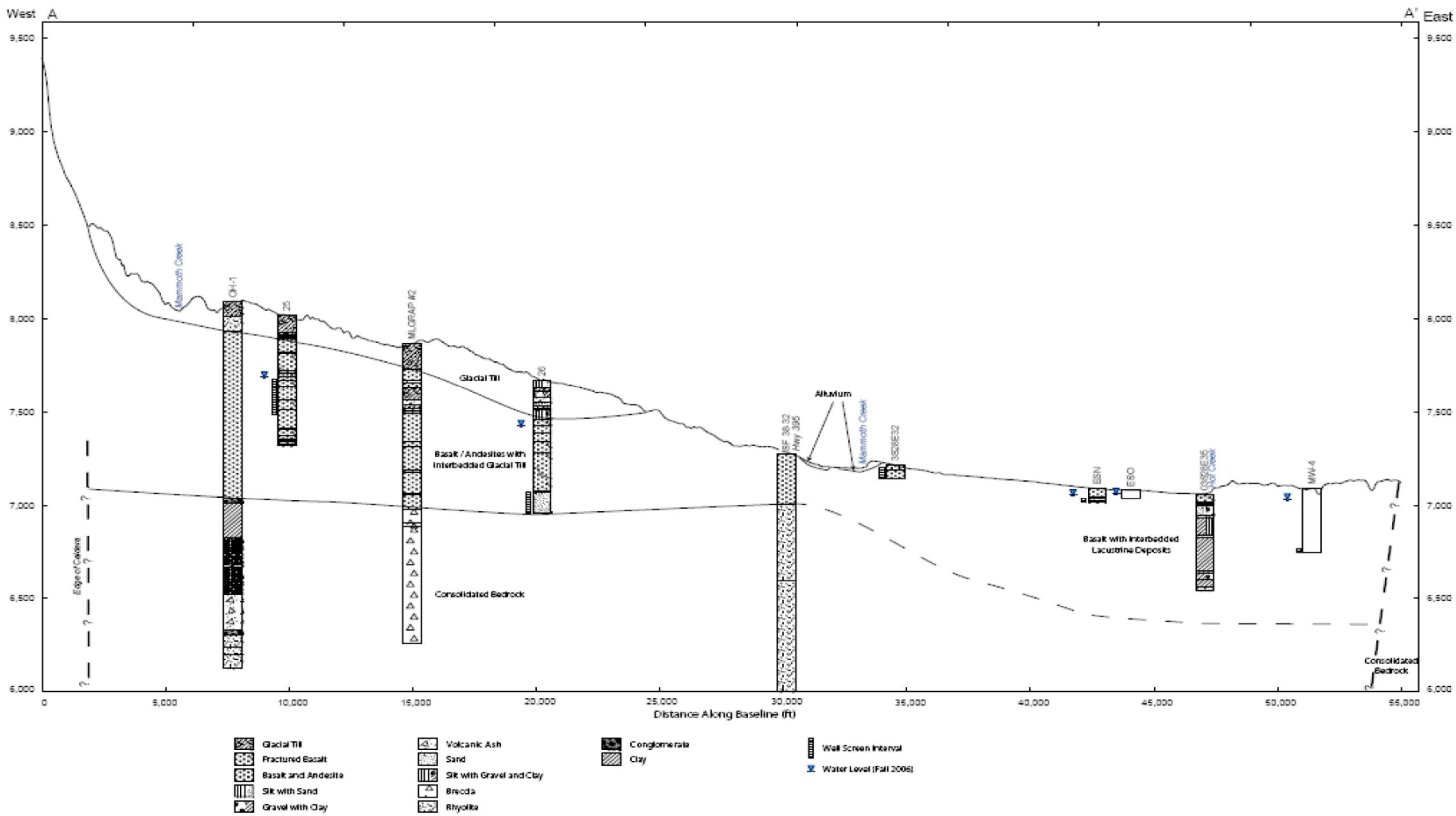


SOURCE: Wildermuth (2009)

The water production wells are located along Section BB'
All of the existing geothermal wells are drilled east of Section CC'

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.7-5
Mammoth Groundwater Basin



SOURCE: Wildermuth (2009)

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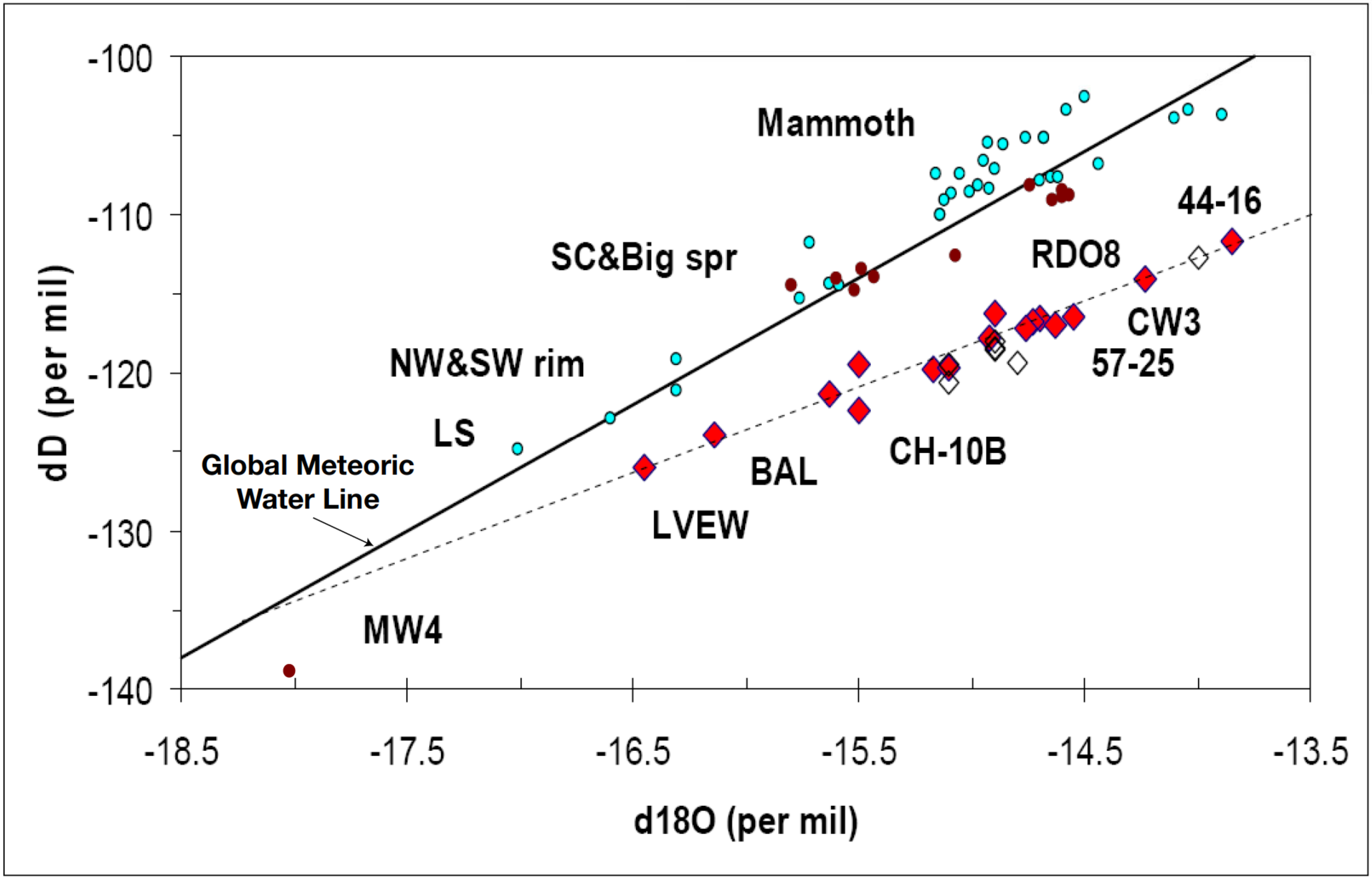
Figure 3.7-6
Mammoth Groundwater Basin geologic Cross-section.
The groundwater aquifer is hosted by glacial till interbedded with basalt/andesite.



Geothermal Monitoring Wells
Shallow Groundwater Wells and Surface Water
Samples Mammoth collected in Community Water District wells

RDO8 Sampling Location Name
Open Symbols - Samples collected by Lawrence Berkeley National Laboratory
Filled Symbols - Samples collected by U.S. Geological Survey

SOURCE: EGS, 2012

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.7-7
Light Stable Isotope Data for Groundwater and Thermal Water in Long Valley Caldera

In summary, the water chemistry of cold groundwaters in the Mammoth Basin and thermal waters is so different that any evidence of inflow of thermal water in the cold waters would be readily detectable; however, these indicators are typically below detection. Furthermore, through much of the drilled section of the caldera, the geothermal zones are separated from cold groundwater aquifers (in younger post-caldera interlayered moat basalts and sediments) by hydrothermally altered zones of low permeability at the top of the Early Rhyolite (host rock for the shallowest portions of the geothermal system). As both the thermal and cold groundwater systems flow east and discharge at the surface or in shallow zones east of Casa Diablo, the physical separations begin to disappear and the systems intertwine, discharging as mixed springs in the eastern caldera. Along the northwest side of the shallow cold Mammoth Groundwater Basin, there are some warmer groundwater wells and shallow geothermal holes which indicate that there are shallow low temperature thermal water zones at approximately 450ft (150m) below the surface above the Early Rhyolite. However, the lack of conclusive chemical influence of the geothermal fluids in these warmer groundwater wells suggests that the geothermal system is not leaking in a detectable way into the Mammoth Groundwater Basin.

3.7.2 Applicable Regulations, Plans, and Polices/Management Goals

3.7.2.1 Federal

Geothermal Resources

43 CFR 3200 outlines the federal regulations applicable to geothermal resource leasing. These regulations outline the requirements for geothermal exploration, well pad construction, drilling operations, well abandonment, utilization of geothermal resources, facility construction, site license, commercial utilization operations, reporting, and site closure.

Groundwater Resources

The USFS’s Technical Guide to Managing Ground Water Resources (2007) (Groundwater Technical Guide) provides guidelines with respect to the management of groundwater resources on lands managed by the USFS. The Groundwater Technical Guide responds to the requirements of the federal Safe Drinking Water Act, the Resource Recovery and Conservation Act, and the Comprehensive Environmental Response, Compensation, and Liability Act, regarding their respective requirements concerning groundwater, by outlining methods and strategies for management of groundwater resources, and by outlining groundwater investigation methods relevant to the USFS. The Groundwater Technical Guide provides guidelines regarding land management and planning, water development, water quality, groundwater dependent

ecosystems, source water protection, inventory and monitoring, data management, and partnerships with other entities. Relevant to the Project, the Groundwater Technical Guide provides for the authorization of special use applications for select wells (including exploratory drilling) and pipelines, and provides general guidance regarding the management of groundwater and associated watersheds.

3.7.2.2 Local

Long Valley Hydrologic Advisory Committee

The Long Valley Hydrologic Advisory Committee (LVHAC) was formed in order to serve an advisory role with respect to management of Long Valley geothermal resources. LVHAC member agencies include the following: BLM; USFS; USGS; California Department of Oil, Gas and Geothermal Resources; California Department of Fish and Game, and Mono County. The LVHAC was formed as a condition of approval for existing geothermal power plants located within the Long Valley caldera. As described in this section, hydrologic features such as fumaroles, hot springs, streams and wells are routinely monitored to evaluate potential effects of geothermal production on these features. The LVHAC meets biannually to make specific recommendations to its various member agencies based upon data collected from this monitoringnetwork. If the CD-IV Project were approved, the LVHAC would evaluate expansion of the hydrologic monitoring program in Long Valley, which would be incorporated as a condition of approval for the project.

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3.8 Geologic, Soil and Mineral Resources

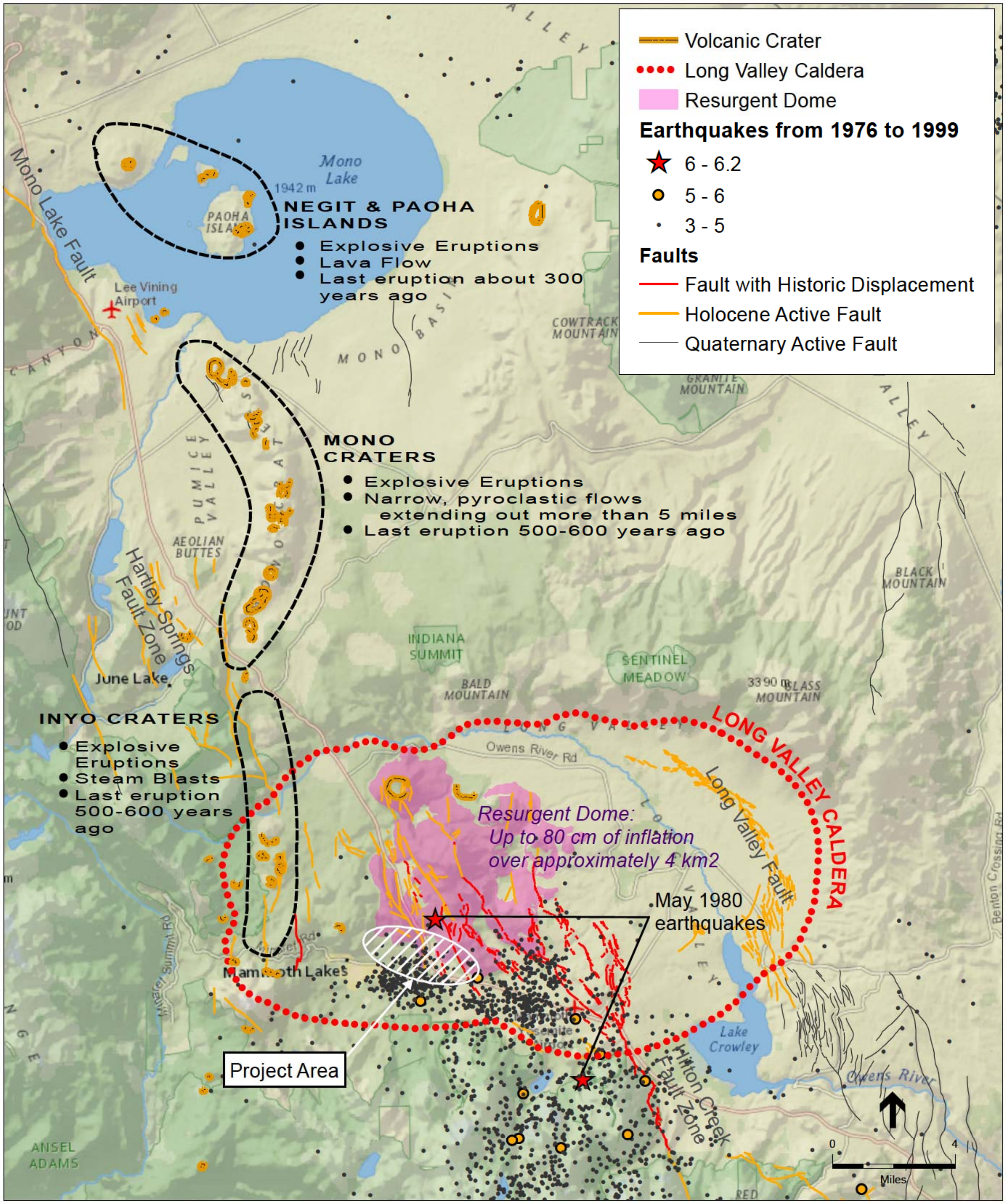
3.8.1 Environmental Setting

3.8.1.1 Regional Geology

The CD-IV Project straddles the western fringe of California's Basin and Range Geomorphic Province[1] and the eastern border of the Sierra Nevada Geomorphic Province (CGS, 2002a). The basin and ranges are characterized by interior drainage with lakes and playas, and typical horst and graben structures (i.e., sub-parallel, fault-bounded ranges separated by down-dropped basins). However, the geologic setting of the Project area is actually quite distinct from the features that typify either geomorphic province, owing to the presence of the Long Valley Caldera and the active geologic processes that formed it. The Long Valley Caldera is a large-scale topographic depression 10 miles wide by 20 miles long, bounded on the west by the Sierra Nevada range, on the north by the Mono Lake basin, on the east by the Basin and Range Geomorphic Province, and on the south by the Owen's Valley. This area of eastern California has produced numerous volcanic eruptions over the past 3 million years, including an immense eruption 760,000 years ago which created the Long Valley Caldera, ejected 145 cubic miles of rock, and spread a thick layer of ash over much of the Western United States (the layer is referred to as the "Bishop Tuff").

Following the collapse of the Long Valley Caldera about 760,000 years ago, volcanic eruptions have continued up until several hundred years ago, though none have had nearly as catastrophic and far-reaching consequences. The location, magnitude, composition and character of these eruptions have varied substantially over time and have resulted in a landscape with a complexity of volcanic terrains and rock types, ranging from recent basaltic magma flows to large expanses of ash-fall tuff[2] and rhyolite[3]. These late Pleistocene-age[4] eruptions are also responsible for forming distinctive topographic and geologic features such as the Resurgent Dome in the west-central part of the caldera, Devil's Postpile basaltic andesite, Red Cones south of the caldera, and Mammoth Mountain itself. As shown in Figure 3.8-1, the most recent eruptions in the area have occurred along the Mono-Inyo volcanic chain extending from the western portion of the caldera northward to Mono Lake. Eruptions along the chain began approximately 40,000 years ago and have continued until as recently as about 300 years ago, when small eruptions built up Negit and Paoha Islands in Mono Lake (over 20 miles north of the Project site). Bursik & Sieh (1989, as cited in EGS, 2012) identified 20 small eruptions within the chain over the past 5,000 years. The most recent dome-forming eruptive events along the Mono-Inyo volcanic chain occurred at the north end of the Mono Craters about 600 years ago and along the south end of the Inyo Domes (closer to the project site) about 700 years ago (EGS, 2012).

1 California's geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landforms with unique, defining features based on geology, faults, topographic relief, and climate.
2 Consolidated or cemented volcanic ash.
3 A group of extrusive igneous rock (i.e., formed by volcanic eruptions) made up of quartz and feldspar mineral grains set within a fine grained glassy matrix.
4 The late Pleistocene epoch refers to the time period from 10,000 to 800,000 years ago.



SOURCE: ESRI, 2012; EGS, 2012; Battaglia et al., 2003

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.8-1
Seismic and Volcanic Hazards

The magma source for these eruptions is an 8 to 10 kilometer-long dike[5] that trends north out of the caldera. The progression of eruptions over the past 2 million years from Glass Mountain on the eastern caldera margin to Mammoth Mountain on the west and the Mono–Inyo volcanic chain to the north suggests that the magmatic system that erupted to form Long Valley Caldera has declined with time and has been supplanted by mixed composition eruptions from the active Mammoth Mountain–Inyo Domes magmatic system (EGS, 2012).

3.8.1.2 Site Topography

The project site is located at an elevation ranging from approximately 7,260 to 7,850 feet above mean sea level (amsl). At about 7,300 feet amsl, the existing geothermal plants are located in upper Basalt Canyon, adjacent to Hot Creek, and the proposed pipelines would extend upstream of Hot Creek to the maximum elevation on the east flank of Mammoth Knolls. Based on coarse-scale elevation data, slope gradients within the footprint of the proposed action are mostly gentle, but are locally moderate; generally ranging from 0 to 5 percent (rise over run), and locally up to 20 percent.

3.8.1.3 Site Geology and Geologic Features

The Project site is underlain by a combination of Quaternary-age[6] volcanic and sedimentary units. The site's geology, faults, and geologic features (such as fumaroles, volcanic vents and thermal springs) are shown on Figure 3.8-2. The following geologic descriptions are derived entirely from an extensive Geographic Information System database and accompanying reports of geologic information for the Long Valley Caldera compiled by Battaglia et al. (2003). The proposed plant site is underlain by relic volcanic flows and domes made up of rhyolite (map unit *Qef*), and the proposed pipeline alignment and wells are underlain by a variety of geologic units including former lava flows, glacial tills, and alluvium. The Project site can be generalized as being underlain by four main categories of geologic units (italic symbols as shown on map):

1. **Alluvium (*Qoa*, *Qal*):** These are surficial deposits of silt, sand and gravel that have shed relatively recently off of the surrounding mountains. Map unit Qoa represents older Pleistocene-age stream deposits (that are no longer sites of active sediment deposition) and have a greater degree of consolidation than the younger Holocene-age stream deposits (map unit Qal). Alluvial deposits form a relatively thin veneer over older volcanic bedrock in the region. The existing geothermal plants and portions of the proposed pipelines east of U.S. Highway 395 overlie the alluvium which partially fills the center of Basalt Canyon.

2. **Glacial till (*Qcd*):** Glacial tills are also considered surficial sedimentary units though glacial till is generally coarser and more poorly-sorted than alluvium. These tills were deposited along the path of former glaciers that extended out of the High Sierra, and often contain cobble- and boulder-sized material chaotically mixed within a mass of sand, silt and clay. Portions of the western half of the proposed pipeline alignment overlie glacial till.

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5 A tabular igneous intrusion that cuts across the bedding or foliation of the country rock.

6 The Quaternary period dates from present-day to approximately 2.6 million years ago. The two epochs in the Quaternary period are the Holocene (0-10,000 years ago) and the Pleistocene (10,000-2.6 million years ago).

3. **Basalt flows *(Qab, Qpb)*:** These rocks are the remnants of lava flows produced at the western edge of the caldera. These rocks are primarily basalts that flowed out volcanic vents, down gradient towards the center of the caldera. These rocks and their former flow directions are shown on Figure 3.8-2. The majority of the central and eastern portion of the proposed pipeline alignment underlies these former volcanic flows.

4. **Rhyolitic volcanic rocks (*Qmrm, Qmr3, Qef, Qet*):** These volcanic rocks are generally divided between those produced during an early succession of explosive eruptions 600 to 700 thousand years ago (i.e., "early" rhyolites), and a later succession of eruptions 100 to 500 thousand years ago (i.e., "moat" rhyolites) (see Figure 3.8-2). The early rhyolites are made up of rhyolite tephra[7] and obsidian flows and were erupted while the center of the caldera began to uplift, arch and fault (i.e., the resurgent dome, shown in Figure 3.8-1). The moat rhyolites later erupted to form thick, steep-sided domes and flows that accumulated on the outer periphery of the resurgent dome. These moat rhyolites were higher in viscosity[8] and lower in temperature than the early rhyolites.

The Long Valley Caldera is recognized as a region of high heat flow; and hot springs, fumaroles, and active hydrothermal alteration are prevalent in many parts of the caldera, and particularly in the project vicinity. Notable concentrations of fumaroles and/or hot springs occur near the existing power plant and in many places are coincident with the trace of active faults (see Figure 3.8-2). The presence of faults, fissures, early volcanic rocks, and the pool of magma that lies deep beneath the ground surface are integral parts of the geothermal system that fuels the Casa Diablo Geothermal Plant. The thermal system, including aquifer characteristics, groundwater movement and geochemistry is described in greater detail in Section 3.7.

3.8.1.4 Soil Resources

Overlying the geologic units described above is a mantle of soil that varies in thickness and character. In general, soil characteristics are strongly governed by slope, relief, climate, vegetation, and the geologic unit upon which they form. Soil types are important in describing engineering constraints such as susceptibility to soil erosion (from both water and wind), corrosion risks, and various behaviors that affect structures, such as expansion and settlement. The type, aerial extent, and some key physical and hydrological characteristics of soils within 100 feet of proposed action were identified based on a review of soil surveys completed by the USFS in cooperation with the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) (NRCS and USFS, 2012). The CD-IV Project area spans two soil survey areas: the vast majority of the project area is within the Inyo National Forest, Western Part survey area (CA732), last updated in 1995; and a narrow sliver lies within the Benton-Owens Valley survey area (CA802), last updated in 2002. Soil units are shown in Figure 3.8-3 and are described in Table 3.8-1.

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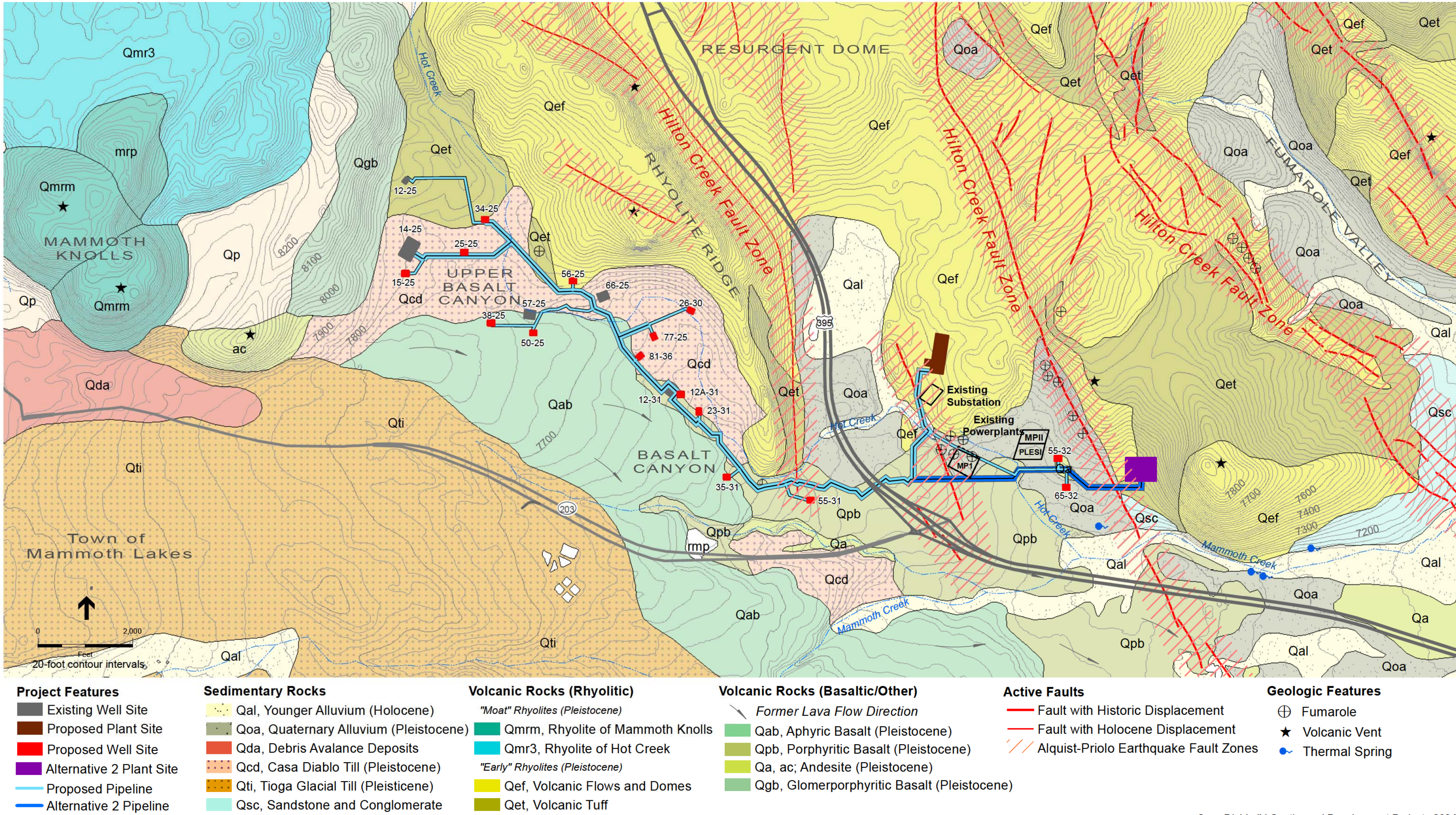
[7] A collective term used for all pyroclastic material, regardless of size, shape, or origin, ejected during an explosive volcanic eruption.

[8] Materials that have high viscosity are thick, sticky, and semifluid in consistency, due to internal friction.



SOURCE: Ormat, 2010; Battaglia et al., 2003

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.8-2
Geologic Units, Faults and Features

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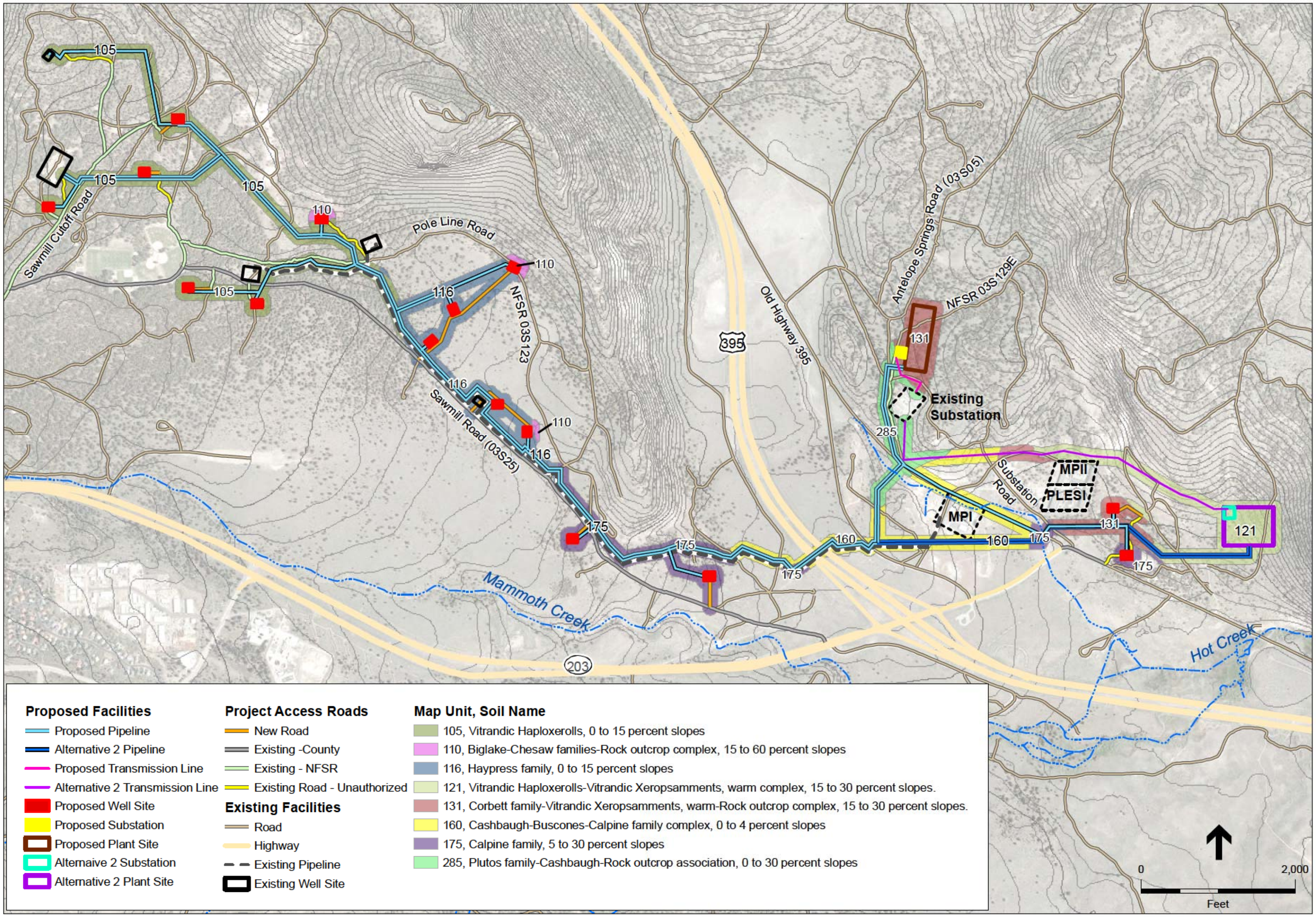

SOURCE: Ormat, 2010; NRCS, 2012

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.8-3
Site Soils

TABLE 3.8-1
SOIL UNITS WITHIN THE PROJECT AREA

Map Unit, Soil Name	Percent of Proposed Action Area	Characteristic Soil Texture / Parent Material	Drainage Class[a]	Hydrologic Group[b]	Erosion Factor (Kw)[c]	Wind Erodibility[d]	Risk of Corrosion[e]	Shrink-Swell Behavior[f]
105, Vitrandic Haplexerolls, 0 – 15 percent slopes	34	Gravelly coarse sand / Pumice and/or residuum weathered from obsidian	Somewhat excessively drained	A	0.02-0.05	1	Low to Moderate	Low
116, Haypress family, 0 to 15 percent slopes	18	Gravelly loamy sand / Till	Somewhat excessively drained	A	0.02-0.15	2	Low to Moderate	Low
175, Calpine family, 5 – 30 percent slopes	17	Gravelly sandy loam / Residuum weathered from sedimentary rock	Well drained	A	0.15	5	Low to Moderate	Low
160, Cashbaugh-Buscones-Calpine family complex	12	Gravelly loamy sand / Volcanic ash and residuum weathered from rhyolitic tuff	Somewhat excessively drained	D-A-A	0.10-0.37	2-2-5	Low to Moderate	Low
131, Corbett family- Vitrandic Xeropsamments, warm-Rock outcrop complex	10	Gravelly loamy sand / Residuum weathered from rhyolite	Somewhat excessively drained	A-A	0.05-0.15	2-2	Low to Moderate	Low
285, Plotos family-Cashbaugh-Rock outcrop association	7	Loamy sand / Volcanic ash over residuum weathered from welded tuff	Somewhat excessively drained	A-D	0.15-0.37	2-2	Low	Low
110, Biglake-Chesaw families-rock outcrop complex	1	Coarse sand, gravel & cobbles / Till	Somewhat excessively drained	A-A	0.02-0.05	1-2	Low to Moderate	Low
121, Vitrandic Haploxerolls-Vitrandic Xeropsamments, warm complex	1	Gravelly coarse sand / Pumice and/or residuum weathered from obsidian	Somewhat excessively drained	A-A	0.02-0.20	1-2	Low to Moderate	Low

NOTE: Dashes within classification columns indicate the classifications assigned to separate soil groups within the map unit. Soil units covering less than 1 percent of the Project Area are not shown.

a Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained.

b Hydrologic soil groups are used for estimating the runoff potential of soils on watersheds at the end of long-duration storms after a prior wetting and opportunity for swelling, and without the protective effect of vegetation. Soils are assigned to groups A through D in order of increasing runoff potential.

c Erosion factor Kw indicates the susceptibility of the whole soil to sheet and rill erosion by water (estimates are modified by the presence of rock fragments). The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. A range of values is given because map units are composed of several soil series.

d Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.

e Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. The risk of corrosion also is expressed as low, moderate, or high.

f Shrink-swell behavior is the quality of soil that determines its volume change with change in moisture content. The volume-change behavior of soils is influenced by the amount of moisture change and amount and kind of clay in the soil. Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent.

SOURCE: NRCS and USFS, 2012

Soils in the Project area all have similar characteristics; all are primarily coarse sandy and gravelly soils, or sandy loams[9], that are well drained with low runoff potential, high wind erosion susceptibility, low shrink/swell potential, and low-to-moderate risk of corrosion (NRCS and USFS, 2012). Many of the soils have significant fractions of gravel and cobbles, especially soils underlain by glacial tills of Pleistocene age. The soils are generally poorly developed, meaning they are young, support fairly thin topsoils, and do not differ greatly in character from the underlying weathered bedrock material. Partially as a result of their low organic content, none of the soils are identified as being prime farmland by the NRCS, nor are they identified as unique farmland or farmland of statewide or local importance by the State's Farmland Mapping and Monitoring Program (NRCS and USFS, 2012; FMMP, 2010).

Soils on the Project site are locally bare and compacted in areas used as forest service roads, recreational routes, or overlain by built structures (e.g., U.S. Highway 395 and the geothermal plant facilities). In all other areas, soils support a combination of Jeffrey pine forest and big sagebrush scrub. In areas previously undisturbed and free from the influence of roads or trails, it is estimated that the erosion hazard rating (EHR) is predominantly low, but moderate in isolated and localized areas, based on soil erodibility factors, runoff production factors, runoff energy rating, and soil cover factors (R-5 FSH 2509.22). The Forest Service Manual for the Pacific Southwest Region (R5), Chapter 2550, outlines management direction that applies to those lands dedicated to growing vegetation, including guidance for desired soil conditions, and for assessing whether soil quality objectives are being met. The three primary functions that soils should serve include support for plant growth function, soil hydrologic function, and a filtering - buffering function. For areas dedicated to specific uses such as roads, trails, recreation and administrative sites, the Water Quality Management Handbook (R5 FSH 2509.22, Chapter 10, Supplement 2509.22-2011-1) is used as the guidance for implementation of best management practices.

3.8.1.5 Mineral Resources

Known mineral resources in the region include the current geothermal system (see Section 3.7), and potential precious metal deposits and industrial minerals such as clay, aggregate, pumice and cinders. The State of California, through its Surface Mining and Reclamation Act of 1975 (SMARA) program, has not mapped or classified the area for the availability of aggregate resources (CDMG, 2001). Other than the geothermal leases, there are no existing mineral resource mining claims or operations within or immediately adjacent to the project area. The closest active mining claims are located approximately 4 miles southwest of the project area in the Mammoth Lakes Basin.

In the greater vicinity, the Blue Chert mine or prospect is a drilled and identified epithermal gold deposit on the southeastern side of the Resurgent Dome with inferred gold reserves of 68 million tons, assuming 0.018 oz/ton. In addition, sources of pumice or cinders generally occur 1.2 to 1.8 miles (2-3 km) north of the CD-IV Project area (EGS, 2012). Claims for kaolinite clay sources

[9] Loam is soil composed of sand, silt, and clay in relatively even concentration (about 40-40-20 percent concentration respectively). The term is often qualified to indicate a relative abundance of one constituent over others (e.g., a "sandy loam" is a loam, but where sand is more abundant than silt and clay).

include the Hundley Clay Pit in the northern part of the Resurgent Dome and numerous small hydrothermally altered areas distributed within the central caldera. Magma Power Company completed annual claim work on these minor prospects during the 1970's to maintain grandfather mineral/geothermal rights prior to federal geothermal lease sales in the 1980's. The claims include alteration areas adjacent to the CD-IV Project area but the potential deposits were never fully evaluated or developed. The Hundley Clay Pit has operated intermittently since 1952. Standard Industrial Minerals, the current owner, trucks kaolinite from the Hundley pit to the company mill north of Bishop. Uses include paint filler, plastic, rubber, paper processing, portland cement, ceramics, insecticides, pharmaceuticals, and stucco (Wilkerson et al., 2007).

3.8.1.6 Adverse Soil Conditions and Ground Instabilities

The natural geology, soils, and/or man-made cuts and fills underlying the Project area present potential hazards related to slope instabilities, soil erosion, expansive soil materials. These hazards are discussed briefly below and provide the initial context for further evaluation in the environmental consequences section.

Landslides

Deep-seated landslides and/or earth flows are not particularly common in the region due to the type, composition and relatively young age of the rocks and the lack of significant accumulation or weathering of soil. However, rock falls and rock wedge-type failures are possible on steeply sloped mountain flanks. As such, slope stability problems in the region are generally limited to steeper slopes, particularly where significant accumulations of talus occur. Rockfall hazard maps provided by Mono County do not indicate the project site is in an area of rockfall risk (Mono County, 2001). As discussed above, slopes within the Project site are generally gentle (0-5 percent) and locally moderate in places such as stream banks and hillsides (up to 20 percent). For these reasons, the long-term risk of landslides under normal conditions at the Project site is low.

Soil Erosion

Erosion is the wearing away of soil and rock by processes, such as mechanical or chemical weathering, mass wasting, and the action of waves, wind and rain. Excessive soil erosion can eventually lead to damage of building foundations and roadways. At the Project site, areas that are susceptible to erosion are those that would be exposed during the construction phase. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or slope protection. As shown in Table 3.8-1, soils within the Project site are well drained and somewhat excessively drained, and generally not prone to high levels of erosion by water, but may be susceptible to wind erosion. In addition, the topography of the site is characterized by gentle slopes and is not currently undergoing rutting, rilling or gullying. However, observation and monitoring of similar soils in the area that are bare and compacted (i.e., unpaved roads) show that rilling can occur on slopes as gentle as 5 percent (Todd Ellsworth, USFS Inyo National Forest). The potential for the proposed action to result in an increase in soil erosion is further discussed in the water resources chapters of this EIS/EIR (Sections 3.19 and 4.19) and in Section 4.8.3.1, *Direct and Indirect Impacts*.

Expansive Soils

Expansive soils possess a "shrink-swell" behavior. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying. Structural damage may occur over a long period of time, usually as a result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Normally, soils that are expansive contain a significant clay fraction, and thus soils underlying the Project area are not likely to exhibit shrink-swell behavior due to their primarily sandy composition, as shown in Table 3.8-1. However, local conditions can vary and the expansion potential of soils within the footprint of the proposed action have not been evaluated in a geotechnical investigation, though based on similarities in geology and soils, the soils are likely to be non-expansive. A geotechnical investigation will be conducted at the proposed plant site as part of the proposed Project. The potential for the proposed action to be adversely affected by expansive soils is further discussed in Section 4.8.3.1, *Direct and Indirect Impacts*.

Settlement

Settlement can occur from immediate settlement, consolidation, or shrinkage of expansive soil. Immediate settlement occurs when a load from a structure or placement of new fill material is applied, causing distortion in the underlying materials. This settlement occurs quickly and is typically complete after placement of the final load. Consolidation settlement occurs in saturated clay from the volume change caused by squeezing out water from the pore spaces. Consolidation occurs over a period of time and is followed by secondary compression, which is a continued change in void ratio under the continued application of the load. In addition, soils tend to settle at different rates and by varying amounts depending on the load weight or changes in soil properties over an area, which is referred to as differential settlement. As discussed above, soils underlying the Project site are similar in nature and do not contain significant clay fractions. For these reasons, the potential for local settlement or differential settlement within site soils is considered to be low. However, local conditions can vary and the settlement and expansion potential of soils within the footprint of the proposed action have not been evaluated in a geotechnical investigation, though based on in the characteristics of regionally mapped geology and soils, the soils are likely to have a low potential for settlement. The potential for the proposed action to be adversely affected by settlement or differential settlement is further discussed in Section 4.8.3.1, *Direct and Indirect Impacts*.

Subsidence

Subsidence is a regional phenomenon of the slow, downward sinking of the land surface. Other types of ground deformation include upward motion (inflation) and horizontal movements. Depending on the magnitude and location of ground deformations, subsidence on both a regional or local scale can potentially damage linear facilities such as roads, buildings and utility lines, particularly when the rates of subsidence (or inflation) differ across a large area. Although it can occur naturally, subsidence can also occur as a result of the extraction of subsurface fluids, including groundwater, hydrocarbons, and geothermal fluids. In these cases, a reduction in reservoir pore pressure reduces the support for the reservoir rock itself and for the rock overlying the reservoir, potentially leading to a slow, downward deformation of the land surface.

Naturally-occurring subsidence most frequently takes place in areas that are tectonically active such as volcanic regions and fault zones. Subsidence can also typically occur in areas where sedimentary basins are filled with unconsolidated sands, silts, clays and gravels. Most known geothermal resources are located in areas that are tectonically active, and may experience natural subsidence. For example, subsidence occurs naturally in the Medicine Lake geothermal area of California due to volcanic activity, even though no geothermal development has yet taken place in the region (GEA, 2007). Because geothermal operations occur at tectonically active sites, it is sometimes difficult to distinguish between induced and naturally occurring subsidence. Subsidence related to geothermal development is more likely in areas where the geothermal reservoir occurs in weak, porous sedimentary or pyroclastic formations. The geothermal reservoir tapped by the proposed wells would be in hard volcanic rocks rather than weak, porous sedimentary or pyroclastic formations.

In most areas where subsidence has been attributed to geothermal operations, the region of earth deformation has been confined to the wellfield area itself, and has not disturbed anything off-site (GEA, 2007). One of the major factors in declaring a volcanic hazard alert for Long Valley was the approximately 31.5 inch (80cm) of measured uplift across the caldera's Resurgent Dome potentially related to magma intrusion. Comparison of differences in bench-mark elevations for five time periods between 1983 and 1997 shows the development and expansion of a subsidence bowl at Casa Diablo. The subsidence coincides spatially with the geothermal well field and temporally with the increased production rates and the deepening of injection wells in 1991, which resulted in an increase in the rate of pressure decline. The subsidence, superimposed on a broad area of uplift, totaled about 310 mm by 1997 (Howle et al., 2003). The subsidence was superimposed on the general pattern of uplift that began in 1980 so that actual land surface elevations at Casa Diablo remained relatively constant with subsidence nearly balanced by uplift (EGS, 2012). The U.S. Geological Survey related the subsidence to geothermal production from the comparatively shallow outflow reservoir at Casa Diablo. The potential for extraction of geothermal waters from the underlying geothermal reservoir to result in subsidence is further discussed in Section 4.8.3.1, *Direct and Indirect Impacts*.

3.8.1.7 Regional Faulting and Seismic Hazards

Geologic hazards in the CD-IV Project area are primarily related to the active volcanic and tectonic setting (see Figure 3.8-1). Hazards that are difficult to predict and episodic, such as earthquake faulting, seismicity, volcanic activity and other hazards are discussed below.

Earthquake Terminology and Concepts

Earthquake Mechanisms and Fault Activity

Faults are planar features within the earth's crust that have formed to release stresses caused by the dynamic movements of the earth's major tectonic plates. An earthquake is produced when these stresses cause the rock to rupture or causes the opposite sides of faults move relative to one another. The movement causes seismic waves to propagate through the earth's crust, producing the ground-shaking effect known as an earthquake. The movement also causes variable amounts of slip along the fault, which may or may not be visible at the earth's surface.

Geologists commonly use the age of offset rocks as evidence of fault activity—the younger the displaced rocks, the more recently earthquakes have occurred. To evaluate the likelihood that a fault will produce an earthquake, geologists examine the magnitude and frequency of recorded earthquakes and evidence of past displacement along a fault. An *active* fault is defined by the State of California as a fault that has had surface displacement within the last 11,000 years. For the purpose of delineating fault rupture zones, the California Geological Survey (CGS) historically defined a *potentially active* fault as a fault that has shown evidence of surface displacement during the Quaternary (last 2.6 million years). However, usage of that term was discontinued because it became apparent that there are so many Quaternary-age faults in the state that it would be meaningless to zone all of them (Bryant and Hart, 2007). In late 1975, the State Geologist made a policy decision to zone only those faults that have a relatively high potential for ground rupture. It was decided that a fault should only be considered for zoning if it is "sufficiently active"[10] and "well-defined."[11] *Blind* faults do not show surface evidence of past earthquakes, even if they occurred in the recent past; and faults that are confined to pre-Quaternary rocks are considered inactive and incapable of generating an earthquake.

Earthquake Magnitude

When an earthquake occurs along a fault, a way to describe its size is to measure the energy released during the event. When an earthquake occurs, a network of seismographs records the amplitude and frequency of the seismic waves it generates. The Richter Magnitude (M) for an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. Richter magnitudes vary logarithmically with each whole number step representing a ten-fold increase in the amplitude of the recorded seismic waves. While Richter Magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude as the preferred way to measure earthquakes. The Moment Magnitude scale (Mw) is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault. Although the formulae of the scales are different, they both contain a similar continuum of magnitude values, except that Mw can reliably measure larger earthquakes and do so from greater distances.

Peak Ground Acceleration

A common measure of ground motion during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile accelerations, one "g" of acceleration is equivalent to the motion of a car traveling 328 feet from rest in 4.5 seconds. Unlike measures of magnitude, which provide a single measure of earthquake

[10] A fault is deemed sufficiently active if there is evidence of Holocene surface displacement along one or more of its segments or branches. Holocene surface displacement may be directly observable or inferred; it need not be present everywhere along a fault to qualify that fault for zoning.

[11] A fault is considered well-defined if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The fault may be identified by direct observation or by indirect methods (e.g., geomorphic evidence). The critical consideration is that the fault, or some part of it, can be located in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

energy, PGA varies from place to place, and is dependent on the distance from the epicenter and the character of the underlying geology (e.g. hard bedrock, soft sediments or artificial fills).

The Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale (Table 3.8-2) assigns an intensity value based on the observed effects of ground-shaking produced by an earthquake. Unlike measures of earthquake magnitude and PGA, the Modified Mercalli (MM) intensity scale is qualitative in nature (i.e. it is based on actual observed effects rather than measured values). Similar to PGA, MM intensity values for an earthquake at any one place can vary depending on its magnitude, the distance from its epicenter, the focus its energy, and the type of geologic material. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage. Because the MM is a measure of ground-shaking effects, intensity values can be related to a range of average PGA values, also shown in Table 3.8-2.

Seismic Context

The CD-IV Project site is located in a broad region of active and potentially active fault zones identified in the U.S. Geological Survey (USGS) Quaternary Fault Database (USGS and CGS, 2006) and is in a region of high seismic hazard relative to many other areas of eastern California (CGS, 2008). Moderate to strong historical earthquakes have occurred on several occasions in the eastern Sierra Nevada and the Owens Valley south of Long Valley Caldera. The largest earthquake to have been recorded in the region—the M ~ 7.6 Owens Valley earthquake—occurred along the Owens Valley Fault in 1872. The northern extent of the rupture zone was located approximately 40 miles south of the Project area. In addition, in May of 1980, a strong earthquake swarm that included four earthquakes of magnitude 6 or above struck the southern margin of Long Valley Caldera in close proximity to the Project area. These events marked the onset of the latest period of caldera unrest which has included recurring earthquake swarms and continued dome-shaped uplift of the central section of the caldera (the resurgent dome) accompanied by changes in thermal springs and gas emissions.

Since 1980, typical background geologic activity in the Long Valley area has included as many as 20 earthquakes of magnitude 2 or smaller a day, occasional swarms of magnitude 3 and larger earthquakes (felt locally), and uplift of the center of Long Valley Caldera at a rate of about 1 inch a year. Since 1980, approximately 31.5 inches (80 cm) of inflation has occurred within the resurgent dome over an area of approximately 1.3 square miles (4 km^2)(see Figure 3.8-1). During this period, changes in the outflow from hot springs and fumaroles and increased CO2 emissions around the flanks of Mammoth Mountain have also been observed. Swarms including magnitude 4 earthquakes may occur about once a year (EGS, 2012).

Seismic Hazards

Surface Fault Rupture

Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake’s seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault.

TABLE 3.8-2
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.0017 g
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.0017-0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017-0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.014–0.039g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.035 – 0.092 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.092 – 0.18 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.18 – 0.34 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34 – 0.65 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65 – 1.24 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

NOTE:

[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCE: ABAG, 2003

Ground rupture is considered more likely along active faults shown in Figure 3.8-2 (i.e., the Hilton Creek Fault). The Hilton Creek fault (formerly referred to as the Taylor-Bryant Fault) that deforms the southeastern caldera margin and splays across the Resurgent Dome is a significant range-bounding normal fault[12] along the eastern side of the Sierra Nevada and is one of the most studied faults within the Sierra Nevada-Basin and Range boundary zone. Exploratory trenching indicates the fault is steeply east-dipping and offsets late Tioga lateral moraines and outwash deposits. Surface-fault rupture along the Hilton Creek Fault was associated with four M 6+ earthquakes that occurred in May 1980 (EGS, 2012). For these reasons, the fault has been zoned by the State of California as an earthquake fault zone[13] under the Alquist-Priolo Act (see Section 3.8.2.2) (CDMG, 1982).

The CGS (formally the California Division of Mines and Geology) evaluated the effects of the 1980 period of seismic unrest and identified ground cracks and minor fault offsets within the Resurgent Dome northeast of the Project site and along the portion of the fault that crosses the junction of SR 203 and U.S. Highway 395 just west of the existing MP-I power plant. As shown in Figure 3.8-2, the following Project components are crossed by a mapped trace of the fault or are within its earthquake fault zone:

1. the southwestern corner of the proposed geothermal power plant, including the proposed substation and electrical transmission line connection;

2. the proposed well site 55-31;

3. and three locations along the proposed pipeline route near the existing MP-I plant, near the proposed CD-IV power plant, and north of well 55-31.

The fundamental design criteria for earthquake stability and seismic hazard avoidance were in place when the current G-1 plant was built in 1985. The existing G-1 plant at Casa Diablo has not had a significant seismicity related problem despite nearly three decades of continued seismic unrest and multiple locally felt earthquakes in and around Casa Diablo. Engineering studies completed in advance of plant construction on a suspected fault found that it “has no evidence of 1980 or even Holocene (within the last 10,000 years) movement.” The trenching revealed “no direct evidence of faulting,” based on the lack of deformation in Pleistocene (2.6 million to 10,000 year old) sediments (Black Eagle Consulting Inc., 2011).

Ground Shaking

The level of ground shaking experienced at any one place during an earthquake depends on its magnitude, the distance from its epicenter, the focus its energy, and the underlying ground conditions (e.g., geologic unit, soil type, and groundwater level). Wells within and adjacent to the Project area penetrate a thin section of poorly consolidated, poorly sorted coarse alluvial,

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[12] A fault in which the hanging wall appears to have moved downward relative to the footwall. The angle of the fault is usually 45-90 degrees.

[13] Earthquake Fault Zones are regulatory zones around active faults. The zones are defined by turning points connected by straight lines. Earthquake Fault Zones are plotted on topographic maps at a scale of 1 inch equals 2,000 feet. The zones vary in width, but average about one-quarter mile wide.

colluvial or till units that have the potential for substantial seismic ground shaking related to soft soil/rock conditions.

The primary tool that seismologists use to evaluate ground-shaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources (including such worse-case scenarios as an earthquake on the Hilton Creek Fault) and estimates their characteristic magnitudes to generate a probability map for ground-shaking. The PSHA maps depict values of peak ground acceleration (PGA) that have a 10 percent probability of being exceeded in 50 years (i.e., a one in 475 annual probability of occurrence). This probability level allows engineers to design buildings for ground motions that have a 90 percent chance of NOT occurring in the next 50-years, making buildings safer than if they were simply designed for the most likely events. The PSHA indicates that at the CD-IV Project site, there is a 10 percent chance of exceeding PGA values of 0.40g to 0.50g over the next 50 years, depending on site-specific ground conditions (CGS, 2012). As indicated in Table 3.8-2, these PGAs are typical of very strong earthquake shaking that would be felt strongly by everyone and have been typically associated with substantial structural damage to older unreinforced masonry, although damage to buildings constructed to modern design standards is typically slight.

Liquefaction

Liquefaction is a transformation of soil from a solid to a liquefied state where saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure that is typical during earthquake ground motion. Soil susceptible to liquefaction includes loose to medium dense sand and gravel. Liquefaction can also occur in low-plasticity silt and some low-plasticity clay deposits, but is much less likely. Soil liquefaction and associated ground failure can damage roads, pipelines, underground cables, and buildings with shallow foundations. Liquefaction can occur in areas characterized by water-saturated, cohesionless, granular materials at depths up to 50 feet. Soil that liquefies can manifest a number of behaviors, including lateral spread, rapid settlement, sand boils, and flow slides.

Within the Project site, alluvium and glacial till (geologic units *Qoa*, *Qal*, *Qa*, and *Qc* in Figure 3.8-2) may be susceptible to liquefaction, although preconditions necessary for liquefaction to occur would be a shallow groundwater table and a substantial fraction of fine-grained sands. If the site were subject to strong ground shaking during an earthquake, saturated alluvium near creeks could potentially liquefy. However, local conditions can vary and the liquefaction potential of soils within the footprint of the proposed action have not been evaluated in a geotechnical investigation. The site-specific information on soils and shallow groundwater within the Project site is not known with great enough certainty to properly evaluate the liquefaction potential of the site. The potential for the proposed action to be adversely affected by liquefaction is further discussed in Section 4.8.3.1, *Direct and Indirect Impacts*.

Seismically-Induced Landslides

The type and occurrence of slope failure hazards have been discussed earlier in this chapter; however, landslides are also a secondary effect of earthquakes because groundshaking can trigger rockfalls and wedge type failures in susceptible areas.

3.8.1.8 Volcanic Hazards

The intense earthquake sequence on May 25, 1980 included four M>6 earthquakes within and around the Long Valley that occurred within days of the May 18, 1980 eruption of Mount St Helens and, in that context, raised strong concerns about the eruptive potential of a large active magma chamber beneath the caldera. Volcanic hazard concepts related to the continuing unrest within the caldera evolved rapidly as research progressed on the Mono-Long Valley magmatic system (Hill, 2006). Based on Long Valley data and a better understanding of restless calderas worldwide, large silicic calderas can go through sustained periods of episodic unrest, separated by years to decades of relative quiescence, all without producing an eruption (Newhall & Dzurisin 1988; Newhall, 2003). Caldera unrest can also be more intense and may extend beyond the comparatively short restless periods associated with central vent volcanoes. Volcanic earthquakes, increased magmatic gases and changes in geothermal manifestations have all occurred in Long Valley Caldera without an eruption.

Future Volcanic Eruption Potential

The USGS volcanic hazards response plan for Long Valley (EGS, 2012) reasoned that potential future eruptions in the region would be similar to the types and scales of eruptive events that have occurred within in the recent past. Eruptive events in the region within the last 50,000 years include explosive eruptions of silicic lavas like those occurred along the north striking Mono Craters and Inyo Domes 500 to 600 years ago (Figure 3.8-1) (EGS, 2012). Volcanic unrest at single-vent volcanoes have been monitored much more closely after the 1980 eruption of Mt St. Helens and patterns of seismic activity, deformation and rapid changes in hydrothermal systems have given strong indications of the location of eruptions shortly before magma reaches the surface. Long Valley is more complex than a single vent volcano and symptoms of volcanic unrest may persist for decades or even centuries at large calderas, such as Long Valley Caldera. Recent studies indicate that only about one in six such episodes of unrest at large calderas worldwide actually culminates in an eruption (EGS, 2012).

The USGS Long Valley Observatory (LVO) monitors volcanic activity through seismicity, emissions of volcanic gas, and ground swelling. Long-term monitoring and geological studies of the Long Valley Caldera and the Mono-Inyo Craters volcanic chain indicate that:

1. Future eruptions are more likely to occur somewhere along the Mono-Inyo Craters volcanic chain than from the resurgent dome or south moat area within the caldera (the project site is close to the south moat area).

2. In the absence of unrest (earthquake swarms, ground deformation, gas emissions, and fumarole activity), the odds of an eruption occurring in any given year along the chain are one in a few hundred (comparable to the odds for a great [magnitude 8] earthquake along the San Andreas fault in coastal California).

3. Unrest can temporarily increase the odds of an eruption, depending on the nature, intensity, and location of the unrest. Current, relatively low levels of unrest increase the odds of an eruption only slightly.

4. Future eruptions are likely to be explosive in style but small to moderate in size

5. Effusive (non-explosive), Hawaiian style eruptions are also possible but somewhat less likely.

6. The odds that a small eruption somewhere along the chain will have a significant impact on any specific place along the chain are roughly one in a thousand in a given year.

7. Larger eruptions are possible but less common (and thus less likely) than smaller ones (true for most volcanoes).

8. Massive eruptions of the size that accompanied formation of Long Valley Caldera 760,000 years ago are extremely rare (none have occurred during the period of written human history). Scientists see no evidence that an eruption of such catastrophic proportions might be brewing beneath Long Valley caldera.

This information, which is a summary of findings by Battaglia et al. (2003), indicates that future volcanic eruptions in the region are certainly a possibility, but would be a low-probability event. Volcanic eruptions are frequently preceded by warning signs (e.g., increased seismicity, gas emissions, etc) and the area most likely to produce volcanic eruptions is located over five miles from the Project site. The worst case scenario for the proposed Project would be a volcanic eruption somewhere within the southern portion of the Mono-Inyo Craters volcanic chain, which depending on its magnitude, could spread large amounts of ash over the Project site and could produce debris flows or mudslides, which may or may not affect the Project site.

Volcano Warning System

As a primary focus of the USGS's Volcanic Hazards Program, the LVO is continually monitoring many of these potential geologic hazards and/or the conditions which may instigate a hazardous condition. Key response activities specified under the response plan for volcano hazards in the Long Valley Caldera and Mono Craters region include (USGS, 2002):

1. ***Condition Green (background activity through strong unrest)*** involves informal information calls to scientists and officials within the USGS and to the California Office of Emergency Services (OES), the USFS, county, and city authorities regarding the nature of the activity and the associated condition as the level of activity increases through the four sub-categories under condition Green.

2. ***Conditions Yellow (intense unrest)*** and higher require the additional commitment of USGS resources and personnel. A condition Yellow will trigger an event response (watch), which includes the following: (1) a formal notification (calldown) to all agencies affected, (2) activation of the USGS LVO field office, which is located in the Mammoth Community Water District facility in Mammoth Lakes, as a base for intensified on-site monitoring and observation, and (3) assignment of authority to the USGS Scientist-in-Charge (SIC) for LVO to direct all USGS personnel engaged in the response.

3. ***Condition Orange (warning)*** will be initiated when the geophysical data suggest that an eruption may break out within a few hours to days. Notification procedures are the same as those for condition Yellow. A condition Orange will initiate the process for a formal geologic hazard warning issued by the Director of the USGS.

4. ***Condition Red*** will be triggered by the onset of eruptive activity, either in the form of phreatic (steamblast) or magmatic eruptions. Notification procedures for condition Red will be the same as those for condition Orange.

5. ***Standown*** criteria specify a schedule for terminating a given condition after activity has fallen below the threshold for that condition level.

Long Valley remains on an active volcanic hazard alert status although the USGS states that earthquake activity within and adjacent to the caldera has remained at a comparatively low level since 1999 (EGS, 2012).

3.8.2 Applicable Regulations, Plans, and Policies/Management Goals

3.8.2.1 Federal

Bureau of Land Management

All federal geothermal lessees must comply with BLM Geothermal Resources Operational (GRO) Orders. GRO Order No. 6 (Pipelines and Surface Production Facilities) provides minimum design and construction requirements for geothermal pipelines and surface facilities to ensure safe operations. GRO Order No. 6 also requires pipeline integrity testing, safety device testing, and operator monitoring as necessary to minimize any danger to human life or health.

U.S. Forest Service

Inyo National Forest Land and Resource Management Plan

Land uses within the Inyo National Forest are governed by the 1988 Inyo National Forest LRMP. The LRMP provides integrated, multiple resource management direction for all Forest resources for the plan period. The Forest-wide Standards and Guidelines set the minimum resource conditions that would be maintained throughout the forest. The Management Area Direction provides general direction for the management of areas whose boundaries are defined with reference to its unique characteristics. The majority of the Project area, and all of the proposed surface disturbing activities, is located within the northwestern corner of LRMP Management Area #9 (“Mammoth”). Portions of the northwestern and northeastern corners of the Project area are located within the southwestern corner of LRMP Management Area #7 (“Upper Owens River”).

The LRMP includes the following Standards and Guidelines with respect to soils.

1. Reduce accelerated soil erosion resulting from management activities to natural background levels within three years after the soil-disturbing activity.

2. Conduct an order 2 Soil Resource Inventory or an on-site soil investigation to evaluate all areas that are scheduled for modification (vegetation manipulation, combustion, etc.) or subject to concentrated use.

3. Avoid the use of soil-disturbing equipment, OHVs, and trampling by livestock on wet or poorly-drained soils whenever possible.

4. Use earth-retaining structures or other special methods as needed on steep slopes or in areas of instability.

5. Keep dozer-constructed fire lines as narrow as possible, and provide for concurrent erosion control on areas with long, continuous gouges in areas of shallow, compacted, or highly erodible soils.

6. Conserve the surface mineral and/or surface organic layer of the soils by minimizing soil disturbance to maintain long-term productivity.

7. Store topsoil on-site in areas subject to mechanical disturbance. Respread as the top layer when project is complete.

8. Avoid land alterations that could potentially cause significant soil erosion and loss of soil productivity.

9. Stabilize all areas disturbed by management activities to minimize soil erosion.

10. Apply the Best Management Practices (BMPs) from the handbook, "Water Quality Management for National Forest System Lands in California" (USDA, Forest Service, 1979) when implementing ground-disturbing activities that may reduce the productivity of the landbase or cause surface erosion or mass wasting.

11. Require an interdisciplinary review to avoid or mitigate adverse impacts for any projects or activities proposed in areas identified in the soil resource inventories as having an erosion hazard rating of nine or greater.

12. Limit disturbance to no more than five percent per decade on that portion of a management area characterized by steep slopes, very high erosion potential, or high instability.

The LRMP includes the following Standards and Guidelines for General Mineral Management.

1. Administer mining laws and regulations to permit the uninterrupted production of minerals while assuring the adequate protection of other resources and environmental values.

2. Where valid existing rights within withdrawn areas are exercised, operating plans should be consistent with the purpose of withdrawals.

3. Coordinate the mineral management program with the Bureau of Land Management.

The LRMP also includes the following Standards and Guidelines for the management of Leasable Minerals, which includes Geothermal Resources.

1. Provide for the leasing of National Forest lands for exploration and development of oil, gas and geothermal resources commensurate with other resource values. Follow existing Memoranda of Understanding between the Bureau of Land Management and the Forest Service that relate to oil, gas, and geothermal mineral activities. Follow applicable regulations, operating orders, and notices for oil, gas and geothermal leases issued pursuant to appropriate authority.

2. Prepare environmental documents that analyze full-scale development prior to consenting to Bureau of Land Management’s issuance of geothermal leases.

3. Prepare post-lease environmental documents in cooperation with the Bureau of Land Management for site-specific exploration, development, and production proposals. Assure that impacts to resources are appropriately analyzed. Assure that impacts to these resources are mitigated to the extent possible.

4. Consider the location of fluid conveyance lines and facilities for geothermal development to ensure the viability of deer migration corridors. Encourage geothermal development that utilizes air cooling rather than evaporative cooling systems.

The LRMP also identifies four "Management Prescriptions" applicable to the CD-IV Project area, two of which are relevant to geology, soils and mineral resources: (1) continue cooperation and coordination of geophysical exploration and research with the scientific community; and (2) encourage continued geologic exploration and research relating to post-caldera formation, seismic and volcanic activity and the prediction of future seismic activity and volcanic eruptions.

National Forest Management Act of 1976 (16 U.S.C. 1600-1602, 1604, 1606, 1608.1614)

This law amended the Forest and Rangeland Renewable Resources Planning Act, emphasizing interdisciplinary involvement in the preparation of land and resource management plans. The law reinforced the concept of multiple use management of National Forest System lands and added requirements for resource protection, including soil, water and air resources.

Facilities Engineering

The Facilities Engineering Department of the USFS uses building standards developed by the International Code Council (ICC), which are published in the current edition of the International Building Code (IBC). The latest edition (2012) of the IBC incorporates seismic design standards and criteria that were developed based on California's seismic standards and are thus adopted by California in the California Building Code (CBC).

Soil and Water Conservation Handbook

The Pacific Southwest Region (Region 5) of the USFS adopted a set of best management practices for the protection of water quality and the prevention of soil erosion for lands dedicated to specific uses such as roads, trails, recreation and administrative sites (USFS, 2011). Included is the requirement for the preparation of an erosion control plan to limit and mitigate erosion and sedimentation. In addition, water quality BMPs specific to forest roads and trails, and to leasable mineral activities are provided.

Watershed and Air Management Manual

The Pacific Southwest Region (Region 5) of the USFS adopted a soil manual supplement (Supplement R5-2500-50-2012-1) that applies to those lands dedicated to growing vegetation, and describes soil quality objectives. The supplement includes a process for the inventory and assessment of soil health, including indicators for three primary functions that soils should serve. These include support for plant growth function, soil hydrologic function, and a filtering – buffering function.

3.8.2.2 State

The statewide minimum public safety standard for mitigation of earthquake hazards (as established through the CBC, Alquist-Priolo Earthquake Fault Zoning Act, and the Seismic Hazards Mapping Act) is that the minimum level of mitigation for a project should reduce the risk of ground failure during an earthquake to a level that does not cause the collapse of buildings for human occupancy, but in most cases, is not required to prevent or avoid the ground failure itself. It is not feasible to design all structures to completely avoid damage in worst-case earthquake scenarios. Accordingly, regulatory agencies have generally defined an "acceptable level" of risk as that which provides reasonable protection of the public safety; although it does not necessarily ensure continued structural integrity and functionality of a project [California Code of Regulations (CCR) Title 14, Section 3721(a)]. Nothing in these acts, however, precludes lead agencies from enacting more stringent requirements, requiring a higher level of performance, or applying these requirements to developments other than those that meet the acts' definitions of "project."

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy[14]. In accordance with this act, the state geologist established regulatory zones, called "earthquake fault zones," (EFZs) around the surface traces of active faults and has published maps showing these zones. EFZs are designated by the CGS and are delineated along traces of faults where mapping demonstrates surface fault rupture has occurred within the past 11,000 years. Construction within these zones cannot be permitted until a geologic investigation has been conducted to prove that a building planned for human occupancy will not be constructed across an active fault (CGS, 2002b). These types of site evaluations address the precise location and recency of rupture along traces of the faults and are typically based on observations made in trenches excavated across fault traces.

The Project site crosses the Alquist-Priolo Earthquake Fault Zone for the Hilton Creek Fault zone in several places, including the southwest portion of the of power plant site (see Section 3.8.1). However, the Project does not propose the construction of structures for human occupancy. While it is estimated that six new employees would be required during normal operations and maintenance activities, they would be housed in the plant's existing office. Engineering studies completed in advance of the original plant in 1985 demonstrated the existing facility does not cross an active trace of the fault. The proposed plant would include a control room, a switch house and a turbine house which would be periodically accessed by plant employees, but the proposed structures would not house full-time employees, and thus would not meet the definition of a human occupancy structure (see footnote 15). Therefore, this act would not apply to the Project action and alternatives.

[14] Title 14 of the California Code of Regulations (CCR), Section 3601(e), defines a structure for human occupancy as any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (Public Resources Code, Chapter 7.8, Section 2690-2699.6) directs the Department of Conservation (CGS) to protect the public from earthquake-induced liquefaction and landslide hazards (note that these hazards are distinct from fault surface rupture hazard regulated by the Alquist-Priolo Special Studies Zone Act of 1972). This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones (i.e., zones of required investigation). Before a development permit may be granted for a site within a Seismic Hazard Zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the Project design. Evaluation and mitigation of potential risks from seismic hazards within zones of required investigation must be conducted in accordance with the CGS, Special Publication 117A, adopted March 13, 1997 by the State Mining and Geology Board as updated in 2008.

As of 2012, Seismic Hazard Zone Maps have been prepared for portions of Southern California and the San Francisco Bay Area; however, no seismic hazard zones have yet been delineated for the Project area. As a result, the provisions of the Seismic Hazards Mapping act would not apply to the Project.

California Building Code

The CBC has been codified in the CCR as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within its jurisdiction. The 2010 CBC is based on the 2009 IBC published by the International Code Conference. In addition, the CBC contains necessary California amendments which are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (such as wind loads) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

3.8.2.3 Local

Mono County

Mono County is the local agency responsible for land use planning and authorizations on the private lands which may be disturbed within the Project area. Activities proposed on the private lands within the Project area by Mammoth Pacific LP are subject to the approval of a use permit by Mono County through the Mono County Energy Management Department and the Mono County Planning Commission. If required, ministerial building permits for construction of some aspects of the Project would be granted by the Building Division of the Mono County Community Development Division.

Mono County building regulations (Ord. 08-02 § 1) are enforced by the Mono County Building Division. These regulations generally incorporate by reference the most recent version of the statewide CBC (CCR Title 24), along with local modifications (which are equal to or more stringent than the provisions of the statewide building standards) necessary because of local climatic, geological or topographical conditions. Compliance with applicable building standards is ensured through requirements to obtain building and/or grading permits from the Building Division. Certain projects (determined on a case by case basis by the building official) require an engineering plan check review by in-house or contract engineering consultants to address seismic design, wind load, ground snow load, or because of unconventional or irregular design.

Further, the Chapter 13.08 of the Mono County ordinance code sets forth regulations for the control of clearing, drainage interference, earthwork and erosion control which includes the prevention of erosion or any other damage to off-site property. Applicants proposing to conduct grading or earthwork on county lands must first obtain a grading permit by submitting detailed site plans showing buildings, roads, utilities or other improvements within and adjacent to the area that may be affected by the proposed work; the location of observed springs, swampy areas, areas subject to flooding, landslides, surface faults and mud flows; elevation and terrain data, with cross sections showing existing and proposed grades; and a geologic and soils report providing information on soil suitability (e.g., expansive soils), compaction and fill requirements, and other relevant site-specific data.

The Town of Mammoth Lakes

A portion of the well pipeline would be within the Mammoth Lakes municipal boundary. The Town Municipal Code section 15.24.020 requires that all structures within the boundaries of the town shall be designed to seismic ground accelerations of Ss = 1.68 and S1 = 0.68 as defined in the CBC. The code requires one-third of the design snow load to be added to the deadload of seismic design. In addition, a building permit is required for retaining walls exceeding four feet in height or retaining walls supporting any surcharge or special loads (§ 15.24.070). Such walls are to be designed by a professional engineer licensed in the state.

Finally, the Town Municipal Code section 12.08.076 requires that grading may be conducted under the following permits within the limits of each: 1) a letter of exemption, for minimal work; 2) a building permit, allowing grading within the footprint and as needed for foundation excavations; and 3) a grading permit, for all other conditions. Municipal Code section 12.08.080 requires engineered plans and a soils report to be submitted along with an application for a grading permit.

3.9 Grazing, Wild Horses and Burros

Currently and historically, livestock grazing has been and continues to be a significant use of renewable resources on National Forest System land in the California Desert. The Federal Land Policy and Management Act (FLPMA) and the Public Rangelands Improvement Act of 1978 recognize livestock grazing as a principal use for the production of food and fiber (BLM, 1980). Laws that apply to the BLM and USFS's management of public lands for grazing include the Taylor Grazing Act of 1934, the National Environmental Policy Act of 1969, the Clean Water Act of 1972, the Endangered Species Act of 1973, the Forest and Range Renewable Resources Planning Act of 1974, the FLPMA of 1976, the Public Rangelands Improvement Act of 1978, Forest Service Manual (FSM) 2200 (Range Management), and Forest Service Handbook (FSH) 2200 (Range Management).

The BLM and USFS administer wild horses and burros as guided by the Wild Free-Roaming Horse and Burro Act of 1971. This includes the management of Herd Areas (HA) and Herd Management Areas (HMAs). HAs are those geographic areas where wild horses and/or burros were found at the passage of the Wild Free-Roaming Horse and Burro Act in 1971. HMAs are those areas within HAs where the decision has been made, through Land Use Plans, to manage for populations of wild horses and/or burros. California contains 33 HAs and 22 HMAs (BLM, 2012). According to the 2010 Geocommunicator on the BLM website and the 2006 BLM map for HAs and HMAs, California (south), there are no HAs or HMAs located within or adjacent to the proposed Project. Because the proposed Project would not contain or traverse any established HMAs or HAs, impacts to wild horses and burros are not analyzed further in this document.

Grazing allotments are areas of federal land that are designated and managed for the grazing of domestic livestock, often compatible with other land uses. The proposed Project would contain or traverse established livestock grazing programs in the Inyo National Forest. The LRMP was completed in 1988, providing broad multiple-resource management direction for forest resources. The LRMP has been amended several times since 1988, including in 1995 when forest-wide utilization standards for the grazing of domestic livestock were incorporated.[1] The CD-IV Project area west of U.S. Highway 395 is located within the Sherwin/Deadman Sheep and Goat Allotment. An environmental assessment was completed for this allotment in 1995, and the allotment is also subject to annual operating instructions issued by the District Ranger prior to each grazing season (USFS, 2011). The grazing lease permit holder in this allotment must also comply with Interagency Domestic Sheep Management Strategy measures designed to protect the endangered Sierra Nevada Bighorn Sheep (*Ovis canadensis californiana*) from contracting diseases carried by domestic sheep. These measures require the permittee to account for all sheep, and the USFS and the permittee to locate and recover missing sheep (USFWS, 2001).

The current allotment permittee is Joe F. Echenique Livestock of Bakersfield, California, and the term of the permit is through December 31, 2020. The annual permitted grazing season is from

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[1] In February, 2012, the U.S. Forest Service announced that Inyo National Forest would be among eight national forests to revise their land management plans using a new National Forest System Planning Rule. The U.S. Forest Service anticipates a three-year revision period, with implementation of a new LRMP in 2015 (USFS, 2012).

July 5 to September 30 for 2,600 sheep (USFS, 2011). Sheep are brought into the area by truck and grazed according to a once-over grazing pattern, in which sheep are run in two bands of about 1,300 each; within the allotment the sheep graze openly between established bedgrounds (BLM 2005). Established bedgrounds are located approximately 700 feet east of drill site 26-30 on Pole Line Road; between drill sites 35-31 and 55-31 on Sawmill Road; and one-quarter mile northeast of drill site 34-25 (BLM 2005). The pipeline corridor is predominantly Jeffrey/Sagebrush/ Bitterbrush vegetation and has a low diversity of plants suitable for grazing, while the remainder of the allotment is mapped as Bitterbrush vegetation and consists of plants more suitable for grazing (BLM 2005).

The CD-IV Project area east of U.S. Highway 395 is located within the Hot Creek Cattle and Horse Allotment. Terms and conditions of the LRMP and annual operating instructions issued by the District Ranger prior to each grazing season would apply. The permitted grazing season for this allotment is from June 15 through September 25 for 399 cattle, but also contains an On-and-Off Provision because it forms a natural management unit with intermingled permittee LADWP (USFS 2007). Under this provision, the actual number of head present on the USFS portion during the permitted season may vary up to a maximum of the USFS and LADWP permitted numbers combined, which are 399 head of cattle for USFS and 39 head of cattle for LADWP. The current permittee for this allotment is Dave Wood Ranches of Coalinga, California.

3.10 Land Use

The affected environment for land use consists of the existing and reasonably foreseeable land uses in the CD-IV Project area. Land use can be assessed by analyzing current land activities, land ownership, zoning (where applicable), and policies and land use designations in adopted land use plans.

3.10.1 Environmental Setting

Existing Land Uses

Proposed Action

The Proposed Action would be located in a relatively rural and forested area in southwestern Mono County, California. The project area is primarily on National Forest System land administered by the USFS as part of the Inyo National Forest in unincorporated Mono County. The project area includes grazing allotments in the Inyo National Forest managed for the grazing of domestic livestock. See Section 3.9, Grazing, Wild Horses and Burros, for discussion of this use. The Proposed Action would also be within the Planning Area of the Town of Mammoth Lakes; and a portion of the well pipeline would be within the Mammoth Lakes municipal boundary. The power plant would be located approximately 1.5 miles east of the Mammoth Lakes municipal boundary (Mammoth Lakes, 2007). The well pipeline would traverse U.S. Highway 395. The surface in the vicinity of the Proposed Action is on National Forest System Land managed by the USFS; BLM manages the subsurface estate. The Proposed Action would be within portions of Federal geothermal leases CACA-11667, CACA-11672, CACA-14407, and CACA-14408. Portions of leases CACA-14407 and CACA-14408 are encumbered by a stipulation that states, “Except as otherwise approved by the BLM and the Forest Service, no surface disturbing activities related to geothermal energy development will be permitted on the land designated as No Surface Occupancy areas. In order for exploration or development activities to be approved on these lands, the lessee must show that the proposed activity or development can take place without significantly affecting USFS management objectives for the land in question. Such objectives include visual quality objectives, recreation objectives, and wildlife habitat and population objectives.” Under the Proposed Action, approximately 1.36 miles of pipelines and portions of up to 4 wells are located in the No Surface Occupancy areas.

The majority of the project area is undeveloped, with scattered unimproved roads traversing the area. The proposed power plant would be constructed on Inyo National Forest managed lands containing Jeffrey pine forest habitat. As shown in Figure 2-2, the proposed power plant site is located north of the existing SCE Casa Diablo Substation associated with the Casa Diablo Geothermal Complex, and approximately 0.5 mile northwest of three operating geothermal power plants (MP-I, MP-II, and PLES-I). A transmission line would connect the proposed power plant substation with the SCE Casa Diablo Substation with an up to 1,000-foot long 33 kV transmission line.

Fourteen of the proposed wells would be located in the Basalt Canyon area, in the vicinity of five existing wells (two production wells, two exploration wells, and one monitoring well), in an area of forested land managed by the Inyo National Forest. Two wells would be located southeast of the proposed power plant, east of U.S. Highway 395.

The proposed well pipeline would extend approximately 0.5 mile south from the proposed power plant to an existing pipeline corridor that serves the MP-I geothermal power plant. This segment of the proposed pipeline would partially traverse land owned by ORNI 50, LLC. At the existing pipeline, the proposed well pipeline would split. One section of the well pipeline would extend east approximately 0.7 mile, running parallel to the route of the existing pipeline and then continuing in a new pipeline corridor through Inyo National Forest land, just south of the existing power plants, ending at two proposed well sites. The other section of the well pipeline would extend west/northwest from the split, within the existing pipeline corridor for approximately 1.7 miles, crossing U.S. Highway 395. A small portion of the pipeline would branch off at mile 1.6, extending east approximately 0.3 mile through a new pipeline corridor. At mile 1.7 another branch would extend west approximately 0.5 mile through existing and new pipeline corridor. The pipeline would continue northwest approximately 1.0 mile through a new pipeline corridor at which point it would split into two branches, with one extending west approximately 1.0 mile and another continuing northwest 0.75 mile. All branches would traverse undeveloped forest land managed by Inyo National Forest.

Other existing development in the vicinity of the Proposed Action includes additional facilities associated with the Casa Diablo Geothermal Complex such as offices and maintenance buildings. Properties adjacent to the proposed power plant site are primarily National Forest System lands managed by the USFS. LADWP owns one large parcel to the west of the proposed power plant site. The western-most proposed well sites and well pipelines would be approximately 0.1 mile north of and 0.1 mile southwest of Shady Rest Park in the Town of Mammoth Lakes. Shady Rest Park contains playground equipment, a sheltered picnic area, restrooms, picnic tables, sand volleyball courts, softball fields, soccer fields, a concession stand, and a parking area (Mammoth Lakes, 2011).

Alternative 2

Under Alternative 2 the proposed power plant would be constructed to the east of proposed injection wells 55-32 and 65-32, approximately 0.3 mile east of the existing Casa Diablo Geothermal Complex, as shown in Figure 2-12. The power plant would be located on vacant land covered with Jeffrey Pine forest and sagebrush habitats managed by the Inyo National Forest. The Alternative 2 area also includes grazing allotments in the Inyo National Forest managed for the grazing of domestic livestock. See Section 3.9, Grazing, Wild Horses and Burros, for discussion of this use. The geothermal fluid produced from the production wells would be conveyed to the CD-IV power plant in a pipeline, as described for the Proposed Action, except the pipeline would proceed east from the Highway 395 undercrossing to the Alternative Plant Site, rather than north to the Proposed Action plant site. The new pipeline east of proposed injection wells 55-32 and 65-32 would extend through approximately 0.75 mile of undeveloped Inyo National Forest land.

Alternative 3

Under Alternative 3 the proposed power plant would be constructed in the same location as the Proposed Action, as shown in Figure 2-14. The pipeline route would be mostly similar to the Proposed Action with a few exceptions. The pipeline would extend south from the proposed power plant site similar to the Proposed Action, but would then turn towards the southeast and follow Old Highway 395, passing between the existing MP-I and MP-II/PLES-I power plants. In addition, some of the pipeline routes connecting the wells at the western end of the well field in Basalt Canyon would be slightly altered as compared to the Proposed Action. As under the Proposed Action, the pipeline routes would pass through undeveloped Inyo National Forest land.

3.10.2 Applicable Regulations, Plans, and Policies/ Management Goals

3.10.2.1 Federal

United States Bureau of Land Management

Under the terms of the Geothermal Steam Act of 1970, its amendments and its implementing regulations, the BLM is the federal agency delegated for management of geothermal operations on federal lands leased for geothermal resource development. BLM must approve all operations conducted on the geothermal leases by ORNI 50, LLC. BLM must respond to a Plan of Operation for drilling or a Utilization Plan for resource utilization submitted by a geothermal lessee and either approve or deny the plan. Approval of the Plan would give ORNI 50, LLC the right to build and operate the Project. However, ORNI 50, LLC could not commence construction until a facility construction permit was approved by the BLM. BLM approval of a commercial use permit is also required before the produced geothermal resources could be used. BLM approval of a geothermal sundry notice is required to conduct subsequent well operations on the geothermal wells or make any changes in any other previously approved permit (MPLP, 2010).

United States Forest Service, Inyo National Forest

The USFS, Inyo National Forest, is the surface management agency responsible for the National Forest System lands within the Project area. Per the Geothermal Steam Act of 1970, its amendments and its implementing regulations, BLM must consult with the agency which manages the surface lands of a geothermal lease before approving any operations proposed on that lease. Because the federal geothermal leases are located within the Inyo National Forest, the BLM must consult with the USFS for geothermal projects. The USFS's purpose is to comply with the requirements of the Geothermal Steam Act to participate as the surface management agency in the BLM consultation process. The USFS and BLM have entered into a nationwide MOU for coordinating review of proposed geothermal actions on Federal leases situated within National Forests. USFS must also comply with the NEPA requirements to review and comment on matters which address or relate to its areas of legal jurisdiction and/or area of special expertise. USFS must also concur with the BLM Plan approval for the CD-IV Project (MPLP, 2010).

1988 Inyo National Forest Land Resource Management Plan

Completed in 1988, the LRMP provides direction for management activities in the Inyo National Forest. The LRMP guides where and under what conditions an activity or project on USFS lands can generally proceed. Specific project or activity proposals are analyzed separately, following NEPA procedures (USFS, 1988). The LRMP has been amended several times since it was completed in 1988. The LRMP contains the following goals, standards, and guidelines that would be applicable to the Proposed Action and Alternatives:

Forest Goals

1. *Energy*: Maximum public benefits are obtained from the energy resources of National Forest system lands, while adverse environmental effects on other Forest resources from exploration, development and extraction are minimized. Management operations on the Forest are energy-efficient.
2. *Minerals*: Maximum public benefits are obtained from the mineral (including geothermal) resources of National Forest System lands, while adverse environmental effects on other Forest resources from exploration, development and extraction are minimized.

Forest-wide Standards and Guidelines

1. *Energy*: To the extent possible, require the use of existing roads, disturbed areas, and the co-location or clustering of energy development facilities such as roads, pipelines, power plant and support structure.
2. *Leasable Minerals: Oil, Gas and Geothermal*:
   a. Provide for the leasing of National Forest lands for exploration and development of oil, gas and geothermal resources commensurate with other resource values.
   b. Follow existing Memoranda of Understanding between the BLM and the USFS that relates to oil, gas, and geothermal mineral activities.
   c. Follow applicable regulations, operating orders, and notices for oil, gas, and geothermal leases issued pursuant to appropriate authority.
   d. Consider the location of fluid conveyance lines and facilities for geothermal development to ensure the viability of deer migration corridors. Encourage geothermal development that utilizes air cooling rather than evaporative cooling systems.

(USFS, 1988)

The CD-IV Project components would be located, and surface disturbing activities would occur, within two LRMP management areas: “Mammoth” (#9) and “Upper Owens River” (#7). The LRMP notes that uses in Management Area #9 are directly related to the support of nearby Mammoth Lakes. These include various utilities, the Mammoth Lakes/Yosemite Airport, various parks, the Hot Creek Fish Hatchery, and land owned by the City of Los Angeles. Management Area #9 also contains two important viewsheds (along Highway 395 and SR 203), portions of two grazing allotments (one cattle and one sheep), and is important as a mule deer migration path and staging area in the fall and spring.

The LRMP identifies four “Management Prescriptions” applicable to the Project area. In Management Area #7, Management Prescription 9 (Uneven Aged Timber Management) applies to the northeast corner of the Project area. Management Prescription 16 (Dispersed Recreation) applies to a very small portion of the northwest corner of the Project area. In Management Area #9, Management Prescription 12 (Concentrated Recreation Area) and Management Prescription 15 (Developed Recreation Site) each apply. The LRMP also describes future Management Directions for Management Area #9, including guidelines to direct future uses of lands managed by the USFS.

Tables 3.10-1 and 3.10-2 list each of the LRMP Management Directions for Management Areas #7 and #9, respectively.

3.10.2.2 State

There are no applicable state regulations, plans, or standards that apply to the Proposed Action.

3.10.2.3 Local

Local regulations would only apply to those components of the Proposed Action that are located on private lands.

Mono County

The Mono County General Plan is the County’s long-range planning document. It consists of eight elements: Land Use, Regional Transportation Plan (RTP)/Circulation, Housing, Conservation/Open Space, Safety, Noise, Hazardous Waste Management, and Economic. The purpose of the Land Use Element is “to correlate all land use issues into a set of coherent development policies for the private lands in the unincorporated area of the county” (Mono County, 2009).

The Proposed Action and Alternatives are in unincorporated Mono County, and would be located primarily on National Forest System land designated by the Mono County General Plan as *Resource Management- Inyo National Forest Land & Resource Management Plan* (*RM-INF*). The proposed pipeline would also traverse private land leased by ORNI 50, LLC south of the proposed power plant that is designated as *Resource Management (RM).* The eastern end of the MPLP-leased private land is designated as *Resource Extraction (RE)*(Figure 3.10-1); however, no CD-IV Project activities are proposed on areas designated as *RE* (Mono County, 2010a).

The General Plan states that the *RM* land use designation is intended “to recognize and maintain a wide variety of values in the lands outside existing communities,” including “geothermal or mineral resources.” The General Plan also states that “mining and geothermal exploratory projects” proposed to occur on *RM* lands are permitted uses that are subject to use permit. The *RM-INF* designation recognizes the planning authority of Inyo National Forest (managed by the USFS) over the publically owned land, and that the land is subject to the LRMP (described above under Federal policies).

TABLE 3.10-1
INYO NATIONAL FOREST LRMP MANAGEMENT DIRECTIONS FOR UPPER OWENS RIVER MANAGEMENT AREA (#7)

Fish

Manage O'Harrel Canyon Creek drainage to provide for recovery of Lahontan cutthroat trout.

Geology

Continue cooperation and coordination of geophysical exploration and research with the scientific community.

Encourage continued geologic exploration and research relating to post-caldera formation, seismic and volcanic activity and the prediction of future seismic activity and volcanic eruptions.

Range

Consider placement and timing of water availability for deer and other wildlife when developing water sources for livestock.

Utilize plant species that also benefit wildlife when revegetating rangeland.

Maintain or develop a vegetative mosaic when regenerating range forage.

Encourage water spreading to enhance forage for livestock and sage grouse where feasible.

Develop watering locations away from riparian areas.

Recreation

Program and develop support facilities such as parking areas and trailheads for both nordic and snowmobile access along U.S. 395 and the Scenic Loop Road when opportunities and funding become available. Over snow vehicle (OSV) access to the Inyo Craters will be permitted to continue.

Develop a recreation composite plan to inventory, coordinate, and program the full summer and winter recreation development potential west of U.S. 395. Include the area in Prescriptions #10, #12 and #16. Construct programmed facilities as funds become available.

Prohibit dispersed camping within two miles of the private land boundary of the community of Mammoth.

Pursue reconstruction of Big Springs Campground at a location more suitable for the purpose.

Riparian

Manage riparian areas to maintain high habitat quality for fish, especially in threatened and endangered species waters, wild trout waters, and the meadow reaches of the streams.

Timber

Maintain plantation stocking at the greatest density acceptable to timber management where there are cover needs for deer (e.g., around meadows and along deer migration routes).

Utilize existing roads for timber harvest where practical to minimize impacts on wildlife.

Visual Resources

Develop corridor viewshed analysis and plans to include U.S. 395.

Establish a crossing point for a major powerline route serving the potential geothermal area to the west of U.S. 395 at the least visually sensitive point.

Plan for additional powerline construction with the objective of eventually moving the existing 115 kv line along U.S. 395.

Wildlife

Maintain the productivity of meadows for sage grouse.

Allow management activities that do not significantly interfere with key sage grouse habitat.

Maintain or enhance the integrity of key winter ranges, holding areas, migration routes, and fawning areas for mule deer.

SOURCE: USFS, 1988

TABLE 3.10-2
INYO NATIONAL FOREST LRMP MANAGEMENT DIRECTIONS FOR MAMMOTH MANAGEMENT AREA (#9)

Cultural Resources

Maintain and enhance interpretive sites such as Indian Caves.

Facilities

Allow new ski base areas commensurate with transportation planning.

Fish

Maintain the productivity and resources of Hot Creek Fish Hatchery; study Laurel Pond for introduction of fish; and implement the 1986 Hot Creek Wild Trout Management Plan.

Geology

Cooperate and encourage geophysical exploration and research including post-caldera formation and current and future seismic and volcanic activity.

Lands

Enter into land exchanges where the best use of USFS land would be in the private sector, the exchange would conform to state/county/USFS planning, and the proposed use is consistent with the local General Plan. Allow no exchanges north of SR 203; solicit comment on proposed exchanges from other interested agencies; and allow development on USFS lands where infrastructure is available and the use would have benefits that outweigh adverse impacts.

Recreation

Provide for trail links within the community of Mammoth Lakes; maintain open space areas around the Town for passive use; prohibit dispersed camping; prohibit further development of Shady Rest Park; allow development of Mammoth Creek Park; identify and fund expansion potential of the Shady Rest and Sherwin Creek Campgrounds; and fund the interpretive potential of the Hot Creek geologic site.

Visual Resources

Develop a viewshed analysis for SR 203 and U.S. 395; mitigate visual impacts of major uses seen from these major gateway routes.

Water

Allow development where water supplies are adequate after first meeting the water requirements of natural resources; allow development of new water sources on USFS lands only when private sources have been exhausted; support state and local ordinances that mitigate adverse impacts of runoff onto USFS lands.

Wildlife

Continue to maintain waterfowl habitat at Laurel Pond; and maintain the integrity of winter ranges, holding areas, migration routes, and fawning areas for mule deer.

SOURCE: USFS, 1988

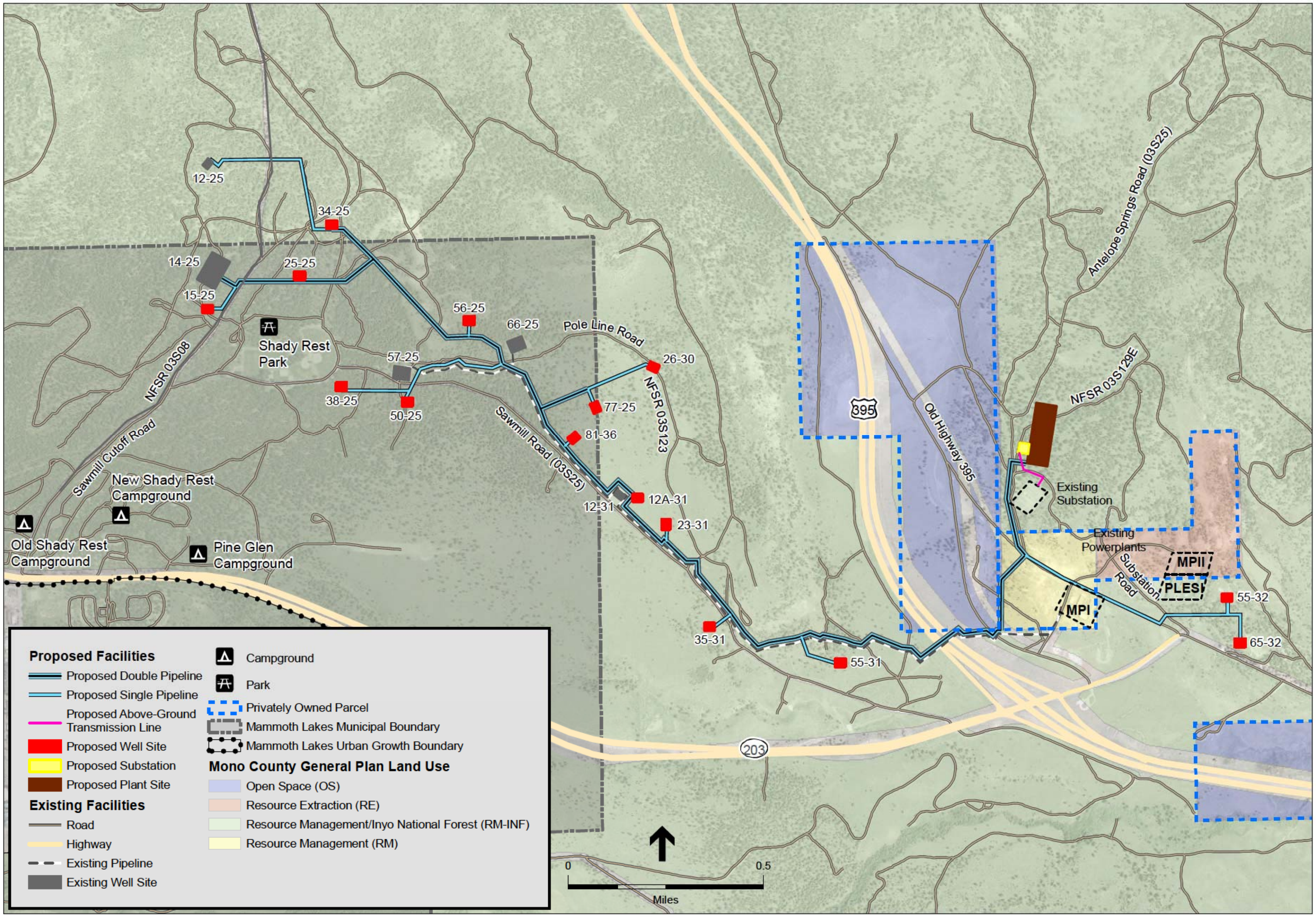
The Mono County General Plan provides policies which apply to private lands in unincorporated areas of the County. The following policies would be applicable to portions of the Proposed Action and Alternatives located on private land (Mono County, 2010a, 2010b):

Land Use Element

Countywide Land Use Policies

Goal: Maintain and enhance the environmental and economic integrity of Mono County while providing for the land use needs of residents and visitors.

Objective A, Policy 4: Avoid the juxtaposition of incompatible land uses.



SOURCE: USFS, 2011; Ormat, 2011

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.10-1
Mono County General Plan
Land Use in the Project Vicinity

Objective A, Policy 5: Regulate future development in a manner that minimizes visual impacts to the natural environment, to community areas, and to cultural resources and recreational areas.

Objective A, Policy 8: Regulate resource extraction in a manner that maintains environmental quality.

Action 8.5: Regulate geothermal development and other energy development projects in a manner consistent with the Energy Resources Policies in the Conservation/Open Space Element.

Objective B, Policy 5: Encourage the continued use of Hot Creek and the Upper Owens River for fishing purposes.

Action 5.2: Establish a Hot Creek Buffer Zone. Development within that zone shall require a finding that all identified environmental impacts of the project are reduced to less than significant levels by the permit conditions.

Mammoth Vicinity

Goal: Maintain and enhance the scenic, recreational, and environmental integrity of the Mammoth vicinity.

Objective A, Policy 1: Future development activity in the Mammoth vicinity shall avoid potential significant visual impacts or mitigate impacts to a level of non-significance, unless a statement of overriding considerations is made through the EIR process.

Objective A, Policy 2: Future development shall be sited and designed in a manner that preserves the scenic vistas presently viewed from U.S. 395.

Objective B, Policy 3: Future development projects shall avoid potential significant environmental impacts or mitigate impacts to a level of non-significance, unless a statement of overriding concerns is made through the EIR process.

Objective C, Policy 4: Regulate geothermal and mining and reclamation activities in the Mammoth vicinity in a manner that retains the scenic, recreational, and environmental integrity of the Mammoth vicinity.

Land Development Regulations

Development Standards for the Resource Extraction land use designation [Section 15.070 (B) (1) (d)] provide limitations for where geothermal development may occur within the Hot Creek Buffer Zone. However, as discussed above, no project components would be designated *RE* and therefore the setback would not apply.

Conservation/Open Space Element

Energy Resources

Goal 1, Objective C, Policy 1: Geothermal development projects shall be phased so that the operational impacts of a permitted project can be assessed before a subsequent project is permitted within an area that may be affected by the permitted project.

Goal 1, Objective D, Policy 1: Geothermal exploration and development projects shall be sited, carried out and maintained by the permit holder in a manner that best protects hydrologic resources and water quality and quantity.

Goal 1, Objective E, Policy 1: Deer are an important natural, biological, and recreational resource. Geothermal exploration, development and operations shall be undertaken in a manner that minimizes or prevents adverse effects on deer population and migration within the deer migration zones.

Goal 1, Objective F: Geothermal exploration and development projects shall be carried out with the fewest visual intrusions reasonably possible.

Goal 1, Objective G: The permit holder shall establish procedures that ensure that neither geothermal exploration nor development will cause violations of state or federal ambient air quality standards or the rules and regulations of the Great Basin Unified Air Pollution Control District (GBUAPCD).

Goal 1, Objective H: Mono County shall establish procedures that assure that neither geothermal exploration nor development creates unacceptable noise. Policy 1: Project conditions shall require compliance with all applicable provisions of the Noise Element and the County Noise Ordinance.

Goal 2: Permit the productive and beneficial development of alternative energy sources, including geothermal resources, consistent with the objectives of Goal I and national and local interests.

Goal 2, Objective A: Provided that the environment is protected in the manner required by the policies and actions of Goal I of this section of the Conservation/Open Space Element, County policy shall ensure the orderly and sound economic development of geothermal resources under the appropriate circumstances.

Goal 2, Objective A, Policy 1: Decisions on applications for geothermal development permits may take into account evidence of national needs for alternative energy development.

Goal 2, Objective A, Policy 2: Decisions on applications for geothermal development permits should be relatively more favorable during times of scarcities of other energy sources.

Goal 7: Minimize the visual and environmental impacts of electrical transmission lines and fluid conveyance pipelines.

Goal 7, Objective A: Electrical transmission and distribution lines and fluid conveyance pipelines shall meet the utility needs of the public and be designed to minimize disruption of aesthetic quality.

Mono County Zoning Designations

Effective since 2000, the Mono County General Plan planning and land use maps supersede county zoning maps. Per Mono County Code of Ordinances, Title 19 – Zoning, Section 19.00.010, “All use and development of private land within the unincorporated area of Mono County shall fully comply with any and all applicable requirements of the Mono County General Plan, which is incorporated herein by this reference as though fully set forth, as the same may be amended from time to time, and any applicable area or specific plans, which are also incorporated herein by this reference.”

Town of Mammoth Lakes General Plan

The Town of Mammoth Lakes General Plan establishes standards, guidelines and priorities that define the community. It consists of nine elements: Economy; Arts, Culture, Heritage and Natural

History; Community Design; Neighborhood and District Character; Land Use; Mobility; Parks, Open Space and Recreation; Resource Management and Conservation; and Public Health and Safety (Mammoth Lakes, 2007).

The Mammoth Lakes General Plan analyzes three planning boundaries: the Town's Urban Growth Boundary (UGB), in which the town allows development consistent with its land use policies; the Municipal Boundary, which includes some private land and some land administered by the USFS as part of the Inyo National Forest; and an approximately 80,000-acre "Planning Area," which includes additional areas of Inyo National Forest and some private land in unincorporated Mono County where the Town considers existing or proposed development to have an impact on the Mammoth Lakes community (Mammoth Lakes, 2007).

No portion of the Proposed Action or Alternatives would be within the Mammoth Lakes Urban Growth Boundary (UGB). A portion of the well pipeline constructed under the Proposed Action and Alternatives would be located outside of the UGB but within the Municipal Boundary, on land designated as *National Forest* (*NF*). The *NF* designation is applied to lands administered by the Inyo National Forest that are outside the adopted UGB. National Forest Land is not subject to the land use jurisdiction of the Town of Mammoth Lakes; however, building codes and other specific Town regulations apply on National Forest land within the Town of Mammoth Lakes' Municipal Boundary (Mammoth Lakes, 2007).

The entire CD-IV Project area is within the Mammoth Lakes Planning Area, which is defined as "the land area addressed by the General Plan. The Planning Area does not lead to regulatory powers outside of the Town limits. Instead, it signals to the County and to other nearby local and regional authorities that town residents recognize that development within this area has an impact on the future of their community, and vice versa" (Mammoth Lakes, 2007).

The Town of Mammoth Lakes General Plan contains the following policies related to land use that are relevant to the Proposed Action and Alternatives (Mammoth Lakes, 2007):

Public Health and Safety Element

S.3.W. Policy: If geothermal power generating facilities are developed on National Forest lands west of State Scenic U.S. Highway 395, the Town shall work with the Mono County Local Agency Formation Commission to review the municipal boundary of the Town and shall annex development if appropriate.

Land Use Element

L.6.G. Policy: Coordinate with agencies undertaking planning or development activities outside of the UGB and within the Town's Planning Area.

Mammoth Lakes Zoning Designations

The Proposed Action and Alternatives would be outside of the Mammoth Lakes Zoning area (Mammoth Lakes, 2010). As such, zoning designations do not apply.

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3.11 Noise and Vibration

The following discussion addresses existing environmental conditions in the affected area, both regionally and specific to the CD-IV Project site. In addition, existing laws and regulations relevant to noise are described.

3.11.1 Environmental Setting

3.11.1.1 General Information on Noise

Noise Background

Noise is defined as unwanted sound. Noise can be described in terms of the following three variables: amplitude (loud or soft), frequency (pitch), and time pattern (variability), and its potential effects can be described in terms of a noise generating source, a propagation path, and a receiver (FTA, 2006). The ambient sound level of a region is defined by the total noise generated within the specific environment and is usually composed of sound emanating from natural sources (birds, leaves, etc.) and from human activities (yard maintenance, vehicles, talking, etc.). Ambient sound levels vary with time of day, wind speed and direction, and level of human activity. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

Decibels (dB) are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. A ruler is a *linear* scale; it has marks on it corresponding to equal quantities of distance. One way of expressing this is to say that the ratio of successive intervals is equal to one. A *logarithmic* scale is different in that the ratio of successive intervals is not equal to one. Each interval on a logarithmic scale is some common factor larger than the previous interval. A typical ratio is 10, so that the marks on the scale read: 1; 10; 100; 1,000; 10,000; etc. Therefore, the cumulative noise level from two or more sources will combine logarithmically, rather than linearly. For example, if two identical noise sources produce a noise level of 50 dB each, the combined noise level would be 53 dB, not 100 dB.

Noise Exposure and Community Noise

Excessive noise exposure has been shown to cause interference with human activities at home, work, or recreation; and can cause community annoyance, hearing loss, and affect people’s health and well-being. Even though hearing loss is the most clearly measurable health hazard, noise is also linked to other psychological, sociological, physiological, and economical effects, either temporary or permanent (USEPA, 1974). Potential human annoyance and health effects associated with noise may vary depending on factors such as: (1) the difference between the new noise and the existing ambient noise levels; (2) the presence of tonal noise, noticeable or discrete continuous sounds, such as hums, hisses, screeches, or drones; (3) low-frequency noise (frequency range of 8 to 1,000 Hertz [Hz]); (4) intermittent or periodic sounds, such as a single vehicle passing by, backup alarms, or machinery that operates in cycles; and (5) impulsive sounds from impacts or explosions (Brüel and Kjaer, 2000). In some cases, noise can also disrupt the normal behavior of wildlife. Although the severity of the effects varies depending on the species being studied and other conditions, research has found that wildlife can suffer adverse physiological and behavioral changes from intrusive sounds and other human disturbances (NPS, 2009).

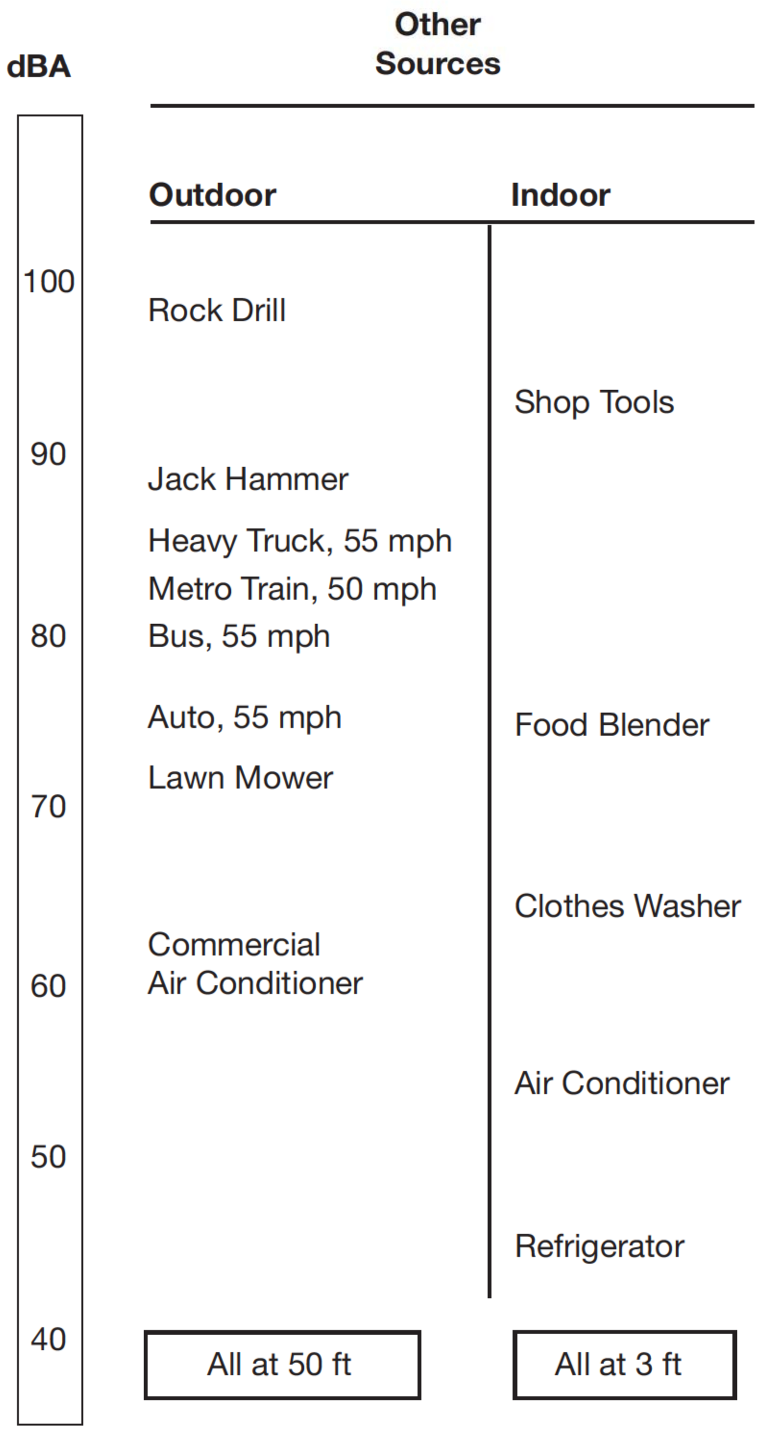
To describe environmental noise and to assess impacts on areas sensitive to community noise, a frequency weighting measure that simulates human perception is customarily used. The frequency weighting scale known as A-weighting best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The dBA scale is cited in most noise criteria. In general, a difference of more than 3 dBA is a perceptible change in environmental noise, while a 5 dBA difference typically causes a change in community reaction. An increase of 10 dBA is perceived by people as a doubling of loudness, and almost certainly causes an adverse community response.

The community noise environment and the consequences of human activities cause noise levels to be widely variable over time. For simplicity, sound levels are usually best represented by an equivalent level over a given time period (L_{eq}) or by an average level occurring over a 24-hour period. The L_{eq}, or equivalent sound level, is a single value for any desired duration, which includes all of the time-varying sound energy in the measurement period, usually 1 hour. The maximum sound level (L_{max}) during a period can also be described as the maximum instantaneous sound pressure level generated by a piece or group of equipment. Since the sensitivity to noise increases during evening and nighttime hours when people are typically trying to sleep, 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time sounds. The Community Noise Equivalent Level (CNEL), is a measure of the day-night noise exposure, with a 5 dB penalty added to evening sounds (7:00 p.m. to 10:00 p.m.) and a 10 dB addition to nighttime sounds (10:00 p.m. to 7:00 a.m.). The day-night average sound level or L_{dn}, is equal to the 24-hour equivalent sound level with a 10 dBA penalty applied to nighttime sounds occurring between 10:00 p.m. and 7:00 a.m.

Community noise levels are closely related to the intensity of human activity and land use. Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In wilderness areas, the L_{dn} noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, the L_{dn} is more likely to be around 50 or 60 dBA. Levels around 75 dBA are more common in busy urban areas (e.g., downtown Los Angeles), and levels up to 85 dBA occur near major freeways and airports.

Effects of Noise on People

People experience a wide range of sounds in the environment. Typical noise levels of indoor and outdoor environments are shown in Figure 3.11-1. Excessive noise can be not only undesirable, but may also cause physical and/or psychological damage. The amount of annoyance or damage caused by noise is dependent primarily upon the amount and nature of the noise, the amount of ambient noise present before the intruding noise, and the activity of the person working or living in the area. Environmental and community noise levels rarely are of sufficient intensity to cause irreversible hearing damage, but disruptive environmental noise can interfere with speech and other communication and be a major source of annoyance by disturbing sleep, rest, and relaxation.



SOURCE: Federal Transit Administration, 2006

Casa Diablo IV Geothermal Development Project . 209484

Figure 3.11-1
Typical A - Weighted Sound Levels

Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, the higher noise levels nevertheless are considered to be adverse to public health. The surrounding land uses dictate what noise levels would be considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments tend to be about 7 dB lower than the corresponding daytime levels. In rural areas away from roads and other human activity, the day-to-night difference can be considerably less. Areas with full-time human occupation that are subject to nighttime noise are often considered objectionable because of the likelihood of disrupting sleep. Noise levels above 45 dBA at night can result in the onset of sleep interference effects. At 70 dBA, sleep interference effects become considerable (USEPA, 1974).

Noise Attenuation

Sound level naturally decreases with more distance from the source. This basic attenuation rate is referred to as the *geometric spreading loss*. The basic rate of geometric spreading loss depends on whether a given noise source can be characterized as a point source or a line source. Point sources of noise, including stationary mobile sources such as idling vehicles or on-site construction equipment, attenuate (lessen) at a rate of 6.0 dBA per doubling of distance from the source. In many cases, noise attenuation from a point source increases by 1.5 dBA from 6.0 dBA to 7.5 dBA for each doubling of distance due to ground absorption and reflective wave canceling. These factors are collectively referred to as *excess ground attenuation*. The basic geometric spreading loss rate is used where the ground surface between a noise source and a receiver is reflective, such as parking lots or a smooth body of water. The excess ground attenuation rate (7.5 dBA per doubling of distance) is used where the ground surface is absorptive, such as soft dirt, grass, or scattered bushes and trees.

Widely distributed noises such as a street with moving vehicles (a “line” source) would typically attenuate at a lower rate of approximately 3.0 dBA for each doubling of distance between the source and the receiver. If the ground surface between source and receiver is absorptive rather than reflective, the nominal rate increases by 1.5 dBA to 4.5 dBA for each doubling of distance. Atmospheric effects, such as wind and temperature gradients, can also influence noise attenuation rates from both line and point sources of noise. However, unlike ground attenuation, atmospheric effects are constantly changing and difficult to predict.

Vibration

Vibration is an oscillatory motion through a solid medium in which the motion’s amplitude can be described in terms of displacement, velocity, or acceleration. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal and is typically expressed in units of inches per second (in/sec). The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the affect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration (FTA, 2006). Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration.

3.11.1.2 Project Setting

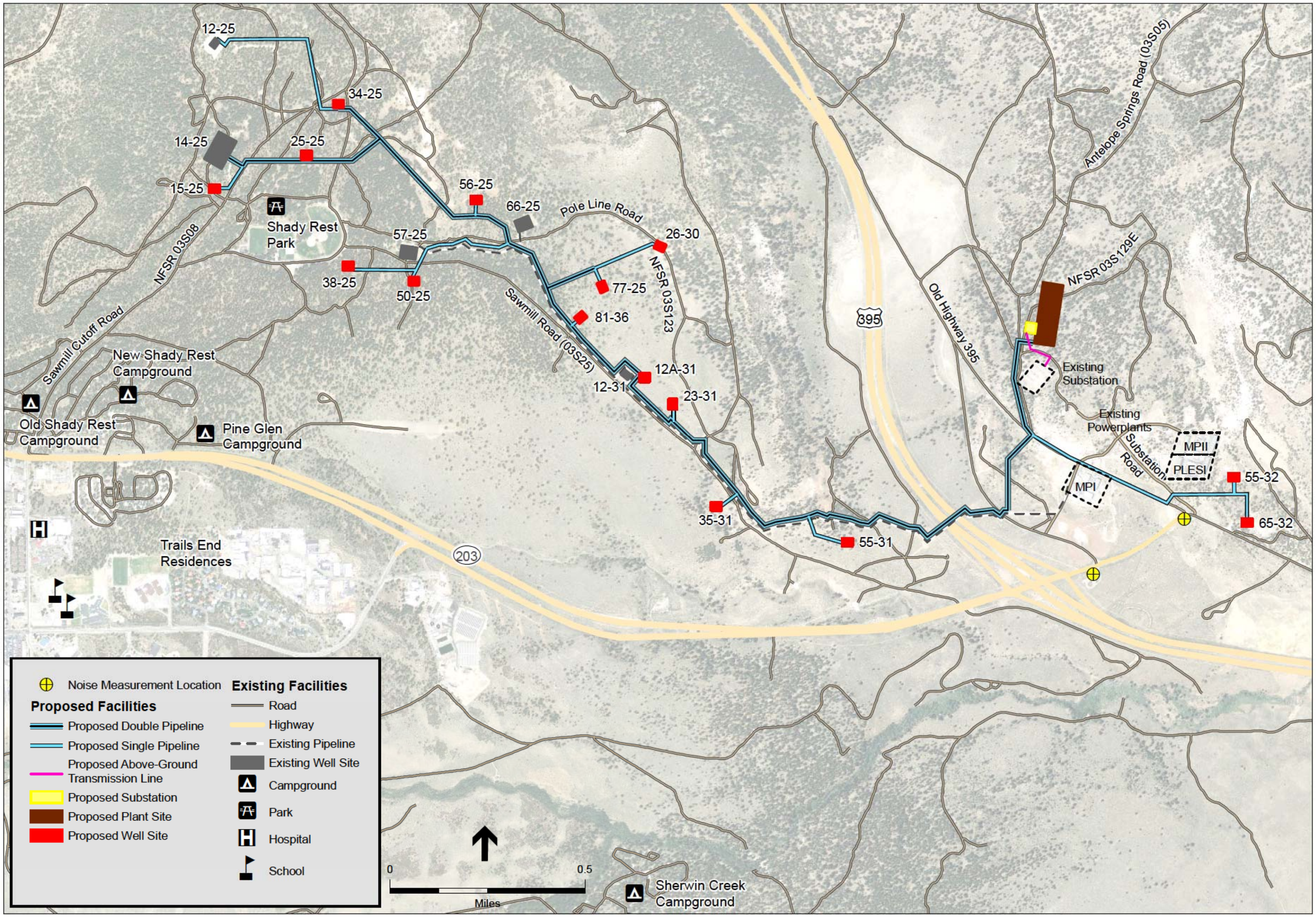
The CD-IV power plant site is located on National Forest System land east of U.S. Highway 395 at Casa Diablo, approximately 2 miles east of the Town of Mammoth Lakes in Mono County, California. The proposed power plant site is approximately 0.5 mile northwest of three existing geothermal power plants, and approximately 500 feet north of an existing SCE substation. The potential geothermal resource wells and pipelines would also be located on National Forest System land in the Basalt Canyon Area west of U.S. Highway 395 and southeast of the proposed power plant site. Most of the lands that surround the CD-IV Project are undeveloped and within the Inyo National Forest.

Sensitive Receptors

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication, and can cause physiological and psychological stress and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences, schools, hotels, hospitals, and nursing homes are considered to be the most sensitive to noise. Places such as churches, libraries, and cemeteries, where people tend to pray, study, and/or contemplate, are also sensitive to noise. Commercial and industrial uses are considered the least noise-sensitive.

The CD-IV Project sites are not within the immediate vicinity of sensitive receptors (e.g., residences, schools, hospitals, daycare centers, long-term care facilities). The closest schools are Mammoth Elementary, Middle, and High Schools, all between approximately 0.9 mile and 1.1 miles from proposed Well Site 38-25 and 50-25, and are over 2 miles from the proposed power plant site. The closest residence to the CD-IV power plant site is at Chance Ranch, approximately 1.5 miles to the southeast, and the closest residences to a proposed well site are along Trails End Road, approximately 0.8 mile southwest of Well Sites 38-25 and 50-25.

Although not considered a noise sensitive receptor, Shady Rest Park, a Town of Mammoth Lakes sports complex, is located approximately 160 feet northwest of proposed Well Site 38-25. Shady Rest Park supports active recreation and includes baseball fields, playground equipment, sand volleyball courts, softball fields, and soccer fields. It also supports quieter activities such as picnicking; however, the overall atmosphere of the park is one of an active community sports complex. Additionally, the CD-IV Project area is a popular location for various recreation uses such as cross country skiing, hiking, and snowshoeing. The closest concentrated recreational land use to any CD-IV Project site is the Shady Rest Campground, approximately 0.5 mile to the west-southwest of Well Site 38-25. Sherwin Creek Campground is located approximately 1.6 miles to the southwest of the CD-IV power plant site and 0.9 mile from Well Site 55-31. The John Muir Wilderness Area is about 2.5 miles to the south of the CD-IV power plant site. For an illustration of the sensitive receptor locations relative to the CD-IV Project, refer to Figure 3.11-2.



SOURCE: USFS, 2011; Ormat, 2011; NAIP, 2010

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.11-2
Noise Measurement Locations

Existing Ambient Noise Conditions

The primary persistent man-made noise source in the CD-IV Project area are the three existing geothermal power plants (i.e., MP-I, MP-II, and PLES-I), existing geothermal production wells, and the SCE substation south of the proposed CD-IV power plant site. Secondary noise sources include occasional off-road vehicles (four wheel drive vehicles, all terrain vehicles, motorcycles/ dirt bikes, and snowmobiles) in the area as well as a target shooting range to the northeast of the Casa Diablo Geothermal Complex. These uses can generate loud and intermittent noise levels depending on the proximity to the receptor. Woodcutting activities also generate periodic noise in the CD-IV Project area and intermittent aircraft noise can be audible from aircraft approaching and departing the Mammoth Yosemite Airport, approximately 3.0 miles southeast of the proposed CD-IV power plant site.

In January 2011, Ormat measured noise levels in the CD-IV Project area on the east side of U.S. Highway 395 and in the vicinity of Well 57-25. Noise levels were monitored at the intersection of SR 203 and Old Highway 395 (about 460 feet south of the existing PLES-I power plant) and by the entrance to the kiosk area off SR 203 (see Figure 3.11-2 for an illustration of the noise monitoring locations relative to the CD-IV Project). The noise level at the intersection of SR 203 and Old Highway 395 was measured to be approximately 65 dBA and the noise measurement technician noted that the noise level was primarily a result of operations at the existing power plants. The noise level at the entrance to the kiosk area off SR 203 was measured to be approximately 60 dBA. The noise at this location was noted to be primarily traffic noise from U.S. Highway 395 and SR 203; the noise measurement technician noted that the existing geothermal plants were not audible at that location. The noise level measured in the vicinity of Well 57-25 was found to be 58 dBA at 100 feet from the well pump (Ormat, 2011).

The residence at Chance Ranch is at a distance from U.S. Highway 395 that is similar to the distance of U.S. Highway 395 from the entrance to the kiosk area off SR 203. Therefore, accounting for the traffic levels along SR 203, it is estimated that the ambient noise levels at the residence at Chance Ranch would be approximately 55 dBA, and the L_{dn} would likely be no lower than 55 dBA. Based on the distance from the Town of Mammoth Lakes to U.S. Highway 395, it is estimated that daytime and nighttime noise levels at receptors in the town would be as low as 40 dBA and 50 dBA, and between 30 dBA and 40 dBA, respectively, depending on site specific conditions such as distance to local roads and other noise sources. These noise levels equal an L_{dn} range of 40 dBA to 50 dBA.

3.11.2 Applicable Regulations, Plans, and Policies/ Management Goals

Regulating environmental noise is generally the responsibility of local governments. The USEPA, however, has published guidelines on recommended maximum noise levels to protect public health and welfare, and the State of California maintains recommendations for local jurisdictions in the General Plan Guidelines published by the Governor’s Office of Planning and Research. The following summarizes the federal and State recommendations and local requirements.

3.11.2.1 Federal

Occupational Safety and Health Act

Under the Occupational Safety and Health Act of 1970 (29 USC §651 et seq.), the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) adopted regulations (29 CFR §1910.95) designed to protect workers against the effects of occupational noise exposure. These regulations list limits on noise exposure levels as a function of the amount of time during which the worker is exposed, as shown in Table 3.11-1. The regulations further specify requirements for a hearing conservation program (§1910.95(c)), a monitoring program (§1910.95(d)), an audiometric testing program (§1910.95(g)), and hearing protection §1910.95(i)). There are no federal laws governing community noise.

TABLE 3.11-1
OSHA-PERMISSIBLE NOISE EXPOSURE STANDARDS

Duration of Noise (hours/day)	A-Weighted Noise Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

SOURCE: USEPA, 1974. 29 CFR §1910.95, Table G-16

Although no federal noise regulations exist, the USEPA has promulgated noise guidelines (USEPA, 1974). The USEPA guideline recommends an L_{dn} of 55 dBA to protect the public from the effect of broadband environmental noise outdoors in residential areas and farms, and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use (USEPA, 1974).

Bureau of Land Management

All federal geothermal lessees must comply with the BLM Geothermal Resources Operational (GRO) Orders. GRO Order No. 4 (General Environmental Protection Requirements) requires that geothermal operations shall not exceed a noise level of 65 dBA, as measured at 0.5 mile from the source or at the lease boundary line, if closer.

3.11.2.2 State

California Government Code §65302 encourages each local government entity to implement a noise element as part of its general plan. In addition, the California Governor's Office of Planning and

Research has developed guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure.

The California Occupational Safety and Health Administration (Cal-OSHA) has promulgated Occupational Noise Exposure Regulations (9 CCR §§5095-5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards described above.

3.11.2.3 Local

Mono County

Mono County is the local agency responsible for adopting and implementing policies as they relate to noise levels and their affect on land uses within its jurisdiction. The Noise Element of the Mono County General Plan identifies goals and policies to attain and maintain acceptable noise levels within the county (Mono County, 2010). Chapter 10.16, *Noise Regulation*, of the Mono County Code promulgates noise standards for various land uses and prohibits noise that would exceed these standards. Table 3.11-2 presents the county's exterior noise limits as identified in the Mono County Code (Mono County, 2012a). Hours of construction are limited by Section 15.06.020 of the Mono County Code (Mono County, 2012b). If construction activities under a building permit are within 500 feet of residential or commercial occupancies, work is limited to the hours between 7:00 a.m. and 8:00 p.m. Monday through Saturday, and between 9:00 a.m. and 5:00 p.m. on Sunday, with the exception that concrete pouring work is permitted during daylight hours from sunrise to sunset (Mono County, 2012b).

TABLE 3.11-2
MONO COUNTY EXTERIOR NOISE LIMITS

		Noise Level (dBA) for Noise Zone Classification		
Receiving Land Use	**Time Period**	**Rural Suburban**	**Suburban**	**Urban**
One & Two Family Residential	10:00 p.m. to 7:00 a.m. 7:00 a.m. to 10:00 p.m.	40 50	45 55	50 60
Multiple Dwelling Residential Public Space	10:00 p.m. to 7:00 a.m. 7:00 a.m. to 10:00 p.m.	45 50	50 55	55 60
Limited Commercial Some Multiple Dwelling	10:00 p.m. to 7:00 a.m. 7:00 a.m. to 10:00 p.m.	55 60		
Commercial	10:00 p.m. to 7:00 a.m. 7:00 a.m. to 10:00 p.m.	60 65		
Light Industrial	Anytime	70		
Heavy Industrial	Anytime	75		

NOTE: The classification of different areas of the community in terms of environmental noise zones shall be determined by the noise control officer, based upon assessment of community noise survey data. Additional area classifications should be used as appropriate to reflect both lower and higher existing ambient levels than those shown. Industrial noise limits are intended primarily for use at the boundary of industrial zones rather than for noise reduction within the zone.

SOURCE: Mono County, 2012a.

According to section 10.16.070 of the Mono County Code, noise levels measured on properties other than those containing the noise source are not allowed to exceed:

1. The noise standard for that land use identified in Table 3.11-2 for a cumulative period of more than thirty minutes in any hour; or
2. The noise standard plus five decibels for a cumulative period of more than fifteen minutes in any hour; or
3. The noise standard plus ten decibels for a cumulative period of more than five minutes in any hour; or
4. The noise standard plus fifteen decibels for a cumulative period of more than one minute in any hour; or
5. The noise standard plus twenty decibels or the maximum measured ambient level, for any period of time.

The county has also established noise standards for construction activity in section 10.16.090 of the County Noise Ordinance. In Type I Areas (i.e., Single-family Residential land use category), noise from mobile construction equipment is limited to 75 dBA during the day (i.e., from 7:00 a.m. to 8:00 p.m.) except on Sundays and legal holidays. At night (i.e., from 8:00 p.m. to 7:00 a.m.) and all day on Sundays and legal holidays, the maximum permitted noise level from mobile construction equipment is 60 dBA. In these same areas noise from stationary equipment is limited to 60 dBA during the day, except on Sundays and legal holidays. At night and all day on Sundays and legal holidays, the maximum permitted noise level from stationary equipment is 50 dBA (Mono County, 2012a). In Type II Areas (i.e., Multifamily Residential land use category), which for the purposes of this analysis includes campgrounds, noise from mobile construction equipment is limited to 80 dBA during the day except on Sundays and legal holidays. At night and all day on Sundays and legal holidays, the maximum permitted noise level from mobile construction equipment is 65 dBA. In these same areas noise from stationary equipment is limited to 65 dBA during the day, except on Sundays and legal holidays. At night and all day on Sundays and legal holidays, the maximum permitted noise level from stationary equipment is 55 dBA (Mono County, 2012a).

Town of Mammoth Lakes

The Town of Mammoth Lakes noise ordinances would apply to the CD-IV Project components that would be within the town limits. Town of Mammoth Lakes Municipal Code Chapter 8.16 limits excessive noise, and section 8.16.090 (Prohibited Acts) identifies noise limits for construction work. section 15.08.020 limits the hours of construction work to between 7:00 a.m. and 8:00 p.m., Monday through Saturday. Work hours on Sundays and town recognized holidays is limited to the hours between 9:00 a.m. and 5:00 p.m. and is permitted only with the approval of the building official or designee (Town of Mammoth Lakes, 2012a). Exterior noise limits and construction noise standards within the municipal boundaries are the same as those established by Mono County (Town of Mammoth Lakes, 2012a and 2012b; see Mono County regulatory discussion, above).

3.12 Population and Housing

This section provides a description of population and housing for the Project area. The CD-IV Project and Alternatives would be constructed in unincorporated areas of Mono County, east of the Town of Mammoth Lakes. Information in this section is based on data obtained from local and state sources.

3.12.1 Environmental Setting

The CD-IV Project is located in southwest Mono County, a rural county on the eastern side of California's Sierra Nevada range. The CD-IV Project is within unincorporated Mono County; however, the Municipal Boundary of the Town of Mammoth Lakes, Mono County's only incorporated area, is approximately two miles west of the proposed power plant, and the CD-IV Project and Alternatives would be located within the Town of Mammoth Lakes Planning Area. A portion of the proposed wells and pipelines would be within the Municipal Boundary (Mammoth Lakes, 2007). The Town of Mammoth Lakes contains over half of the County's population (CA DOF, 2011a). Approximately 94 percent of the county is public or quasi-public land administered by the BLM, USFS, the State of California, or LADWP (MCLTC, 2011). Table 3.12-1 shows 2011 population and housing estimates for unincorporated Mono County and the Town of Mammoth Lakes.

TABLE 3.12-1
2011 POPULATION AND HOUSING ESTIMATES, JANUARY 1, 2011

Jurisdiction	Total Population	Total Housing Units	Total Households	Vacant Units	Vacancy Rate
Unincorporated Mono County	6,022	4,299	2,547	1,752	41%
Mammoth Lakes	8,286	9,629	3,230	6,399	67%

SOURCE: CA DOF, 2011a

As demonstrated in Table 3.12-2, which shows historic and projected population growth from 1980 to 2030, over the past three decades Mono County and the Town of Mammoth Lakes have experienced steady growth. According to the California Department of Finance (CA DOF), the County's total population increased by approximately 16 percent in the 1980s, from 8,700 in 1980 to 10,100 in 1990 (CA DOF, 1990). The 2000 population estimate was 12,839 persons, which further increased the population by approximately 27 percent (CA DOF, 2010). The County was projected to grow an additional 16 percent between 2000 and 2010, reaching an estimated 14,833 residents (CA DOF, 2007).

As shown in Table 3.12-2, the Town of Mammoth Lakes followed similar trends for population growth as Mono County within the same time period. In addition, the Town of Mammoth Lakes is a resort-oriented community that experiences large seasonal fluctuations in population (Mammoth Lakes, 2010). The Town of Mammoth Lakes estimates that, on any given weekend during the peak ski season, the influx of visitors to Mammoth Lakes can result in a total "Population at One Time" (PAOT) that is up to five times the year-round resident population (Mammoth Lakes, 2010).

TABLE 3.12-2
HISTORIC AND PROJECTED POPULATION GROWTH, 1980–2030

Area	1980	1990	% Change 1980–1990	2000	% Change 1990–2000	2010	% Change 2010–2010	2020	% Change 2010–2020	2030	% Change 2020–2030
Mono County	8,700	10,100	16%	12,839	27%	14,833	16%	18,080	22%	22,894	27%
Mammoth Lakes	3,929	4,785	22%	7,093	48%	8,235	16%	8,936	9%	9,784	9%

SOURCE: CA DOF, 1990; CA DOF, 2007; CA DOF, 2010; CA DOF, 2011b; MCLTC, 2008

As shown in Table 3.12-2, the populations in Mono County and the Town of Mammoth Lakes are expected to increase over the next 20 years, reaching 22,894 and 9,784 people, respectively (CA DOF, 2007; MCLTC, 2008).

3.12.2 Applicable Regulations, Plans, and Policies/ Management Goals

3.12.2.1 Local

Mono County General Plan

The Conservation/Open Space Element of the Mono County General Plan contains the following objective and goals related to population and housing that are relevant to the Project and alternatives (Mono County, 2010):

> ***Mineral Resources, Objective C*****:** Manage all mineral resource development activities in a manner that adequately protects the public health, safety, and welfare as well as environmental and socio-economic values.
>
> ***Energy Resources, Goal 2*****:** Permit the productive and beneficial development of alternative energy sources, including geothermal resources, consistent with the objectives of Goal 1 and national and local interests.
>
> ***Energy Resources, Goal 2, Objective A, Policy 3*****:** Mono County's geothermal resources shall be managed in a manner that assures reasonable economic benefits to the citizens and businesses of the county.

Mammoth Lakes General Plan

The Land Use Element in the Town of Mammoth Lakes General Plan contains the following policy related to population and housing that is relevant to the CD-IV Project and Alternatives (Mammoth Lakes, 2007).

> ***L.1.A. Policy:*** Limit total peak population of permanent and seasonal residents and visitors to 52,000 people.

3.13 Public Safety, Hazardous Materials and Fire

The following discussion addresses existing environmental conditions in the affected area of the CD-IV Project, and describes existing laws and regulations relevant to health and safety. The affected environment includes hazardous materials associated with geothermal power production, fire hazards, airports, and public safety.

3.13.1 Environmental Setting

3.13.1.1 Hazardous Materials

The term "hazardous materials" refers to both hazardous substances and hazardous wastes. Under federal and state laws, any material, including wastes, may be considered hazardous if it is specifically listed by statute as such or if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases). The term "hazardous material" is defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.[1]

Existing Environmental Site Contamination

The State Water Resources Control Board (SWRCB) Geotracker database and the Department of Toxic Substances Control (DTSC) Envirostor database list known hazardous materials sites that have been subject to investigation related to potential environmental contamination resulting from a release of hazardous materials. According to these databases, there are no hazardous materials facilities subject to corrective action in the Project area (SWRCB 2011; DTSC, 2011).

Hazardous Materials Use at the Existing Casa Diablo Geothermal facilities

The Hazardous Materials Business Plan (MPLP, 2008) for the three existing geothermal facilities identifies the hazardous materials used and average quantities stored on-site, hazardous wastes generated, and facility emergency response plans. The CD-IV Project would use similar types of hazardous materials as the existing facilities; these uses are described below.

Working Fluid

The binary geothermal process utilizes a working fluid which is heated by the geothermal fluid and run through a closed-loop binary process cycle to convert mechanical energy to electrical energy. Isobutane, a liquid petroleum gas, is used as the working fluid by the three existing Casa Diablo geothermal plants in the Project area. Each plant stores up to 35,000 gallons of isobutane within the closed-loop vessels and isobutane accumulators (MPLP, 2008). The fire suppression systems at each facility include multiple isolation valves and containment systems to prevent a major release. According to Mr. Fred Stump, Fire Chief at the Long Valley Fire Protection District (LVFPD), there has been only one incident of isobutane release at the existing

1 State of California, Health and Safety Code, Chapter 6.95, §25501(o).

geothermal plants, which occurred sometime in the 1980s. The isolation valves functioned properly to isolate the leaking pipeline and the product was flared off (LVFPD, Fred Stump, personal communication, 2011).

Geothermal Fluid

Geothermal fluid is comprised of water and dissolved solids. It is under high pressure, and is extremely hot. The two existing Basalt Canyon wells produce geothermal fluids with an approximate temperature of 356^{o}F (180^{o}C)). The geothermal fluid gathering system utilized by the existing Casa Diablo Geothermal Complex consists of a network of wellhead and downhole facilities and insulated pipelines approximately 14 inches in diameter. Geothermal fluids produced from the Casa Diablo area contain low concentrations of arsenic, antimony, mercury and other heavy metals which could be harmful to human health or the environment in large doses. The geothermal fluids also contain small concentrations of hydrogen sulfide, a toxic gas that smells like rotten eggs.

Fuels, Lubricants, and Other Hazardous Materials

Power plant operations require the use of turbine oils, transformer oils, hydraulic oils, lubricating oils, diesel fuel, gasoline, antifreeze, and various compressed gases. Each turbine contains approximately 1,500 gallons of oil. Bulk storage of hazardous materials used by the three facilities is located a shared maintenance building and oil storage area. Oils are typically stored in 55-gallon containers; the waste oils are collected in a 5,000-gallon waste oil tank.

Within the wellfield, a 55-gallon container of lubricating oil is stored at each production well. Anti-scalant is also used at two of the existing wells.

Drilling and Construction-Related Hazardous Materials

During geothermal well drilling operations, hazardous materials are stored at the well sites. These materials may include diesel fuel-powered equipment, drilling mud additives such as gel, polymers and slurry (these may contain small quantities of crystalline silica), miscellaneous lubricants, and solvents.

3.13.1.2 Emergency Response

ORNI 50, LLC has developed an Emergency Response/Contingency Plan which addresses possible emergencies such as well field blowouts, major spills, earthquakes, volcanic eruptions, and fires. This plan has been approved by the LVFPD.

The Town of Mammoth Lakes has developed an area-wide emergency evacuation plan. Mammoth Scenic loop road (Forest Route 3S23), located about three miles west of the

Project area, and SR 203, located south of the CD-IV Project area, are the major evacuation routes for area residents. Mono County's Emergency Operations Plan outlines potential emergency response scenarios and responsible agencies (Mono County Sheriff, 2007).

3.13.1.3 Fire Hazards

The Project is located within areas designated as moderate to high fire hazard severity (CalFire, 2007). Wildfires are a concern in the Inyo National Forest, especially in the areas of wildland urban interface surrounding the Town of Mammoth Lakes. Forest vegetation, such as Jeffrey pine, shrubs and grasses, is susceptible to wildland fire, particularly during the dry, summer fire season. Typically, forest fires are attributable to lightning strikes or human activity.

Large quantities of flammable working fluid, isobutane, are currently used and stored at the three existing power plants. The storage and use of this flammable gas (or liquid, depending upon the ambient temperature) presents a fire hazard.

3.13.1.4 Aircraft Operations

The proposed Project site is not located within two miles of a public airport or public use airport. The closest public airport is the Mammoth Yosemite Airport, located approximately 3 miles southeast of the Project site.

3.13.2 Applicable Regulations and Oversight Agencies

3.13.2.1 Federal

Comprehensive Environmental Response and Liability Act (CERCLA). Superfund Amendments and Reauthorization Act (SARA) of 1986 (42 USC Section 9601 et seq.)

The SARA amends CERCLA and governs hazardous substances. The applicable part of SARA is Title III, otherwise known as the Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA). Title III requires states to establish a process for developing local chemical emergency preparedness programs and to receive and disseminate information on hazardous substances present at facilities in local communities. The law provides primarily for planning, reporting, and notification concerning hazardous substances. Key provisions require notification when extremely hazardous substances are present above their threshold planning quantities; immediate notification to the local emergency planning committee and the state emergency response commission when a hazardous material is released in excess of its reportable quantity; and that material safety data sheets (MSDSs) for all hazardous materials or a list of all hazardous materials be submitted to the state and local emergency planning agencies and local fire department.

Clean Air Act (CAA) (42 USC 7401 et seq. as amended)

Regulations under the CAA are designed to prevent accidental releases of hazardous materials. The regulations require facilities that store a Threshold Quantity (TQ) or greater of listed regulated substances to develop a RMP, including hazard assessments and response programs to prevent accidental releases of listed chemicals.

Toxic Substances Control Act (15 USC 2605)/Resource Conservation and Recovery Act (RCRA) (42 U.S. Code [USC] 6901 et seq.)/Hazardous and Solid Waste Act (HSWA)

The Federal Toxic Substances Control Act (1976) and the RCRA of 1976 established a program administered by the USEPA for the regulation of the generation, transportation, treatment, storage, and disposal of hazardous waste. The RCRA was amended in 1984 by the HSWA, which affirmed and extended the "cradle to grave" system of regulating hazardous wastes.

U.S. Department of Transportation (USDOT). Hazardous Materials Transport Act (49 USC 5101)

The USDOT, in conjunction with the USEPA, is responsible for enforcement and implementation of federal laws and regulations pertaining to transportation of hazardous materials. The Hazardous Materials Transportation Act of 1974 directs the USDOT to establish criteria and regulations regarding the safe storage and transportation of hazardous materials. CFR 49, 171–180 regulates the transportation of hazardous materials, types of material defined as hazardous, and the marking of vehicles transporting hazardous materials.

Occupational Safety and Health Administration (OSHA), Title 29 CFR 1910

The OSHA's mission is to ensure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. The OSHA staff establishes and enforces protective standards and reaches out to employers and employees through technical assistance and consultation programs.

3.13.2.2 State

Health and Safety Code, Section 25249.5 et seq., Safe Drinking Water and Toxics Enforcement Act, Proposition 65

This law identifies chemicals that cause cancer and reproductive toxicity, provides information for the public, and prevents discharge of the chemicals into sources of drinking water. Lists of the chemicals of concern are published and updated periodically. Businesses are required to notify Californians about the chemicals in products they purchase, in the workplace, or that are released to the environment. By providing this information, individuals are able to make informed decisions about protecting themselves from exposure to these chemicals.

Health and Safety Code, Section 25270, Aboveground Petroleum Storage Act

Health and Safety Code Sections 25270 to 25270.13 ensure compliance with the federal Clean Water Act (CWA). The law applies to facilities that operate a petroleum aboveground storage tank (AST) with a capacity greater than 660 gallons or combined ASTs capacity greater than 1,320 gallons or oil-filled equipment where there is a reasonable possibility that the tank(s) or equipment may discharge oil in "harmful quantities" into navigable waters or adjoining shore lands. If a facility falls under these criteria, it must prepare a Spill Prevention Control and Countermeasure (SPCC) Plan.

Health and Safety Code, Chapter 6.1, Section 25404 et seq., Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program)

This program requires the administrative consolidation of six hazardous materials and waste programs (Program Elements) under one agency, a CUPA. The Program Elements consolidated under the Unified Program are:

1. Hazardous Waste Generator and On-site Hazardous Waste Treatment Programs (a.k.a., Tiered Permitting);
2. Aboveground Petroleum Storage Tank SPCC;
3. Hazardous Materials Release Response Plans and Inventory Program (a.k.a. Hazardous Materials Disclosure or "Community-Right-To-Know");
4. California Accidental Release Program (CalARP);
5. Underground Storage Tank (UST) Program; and
6. Uniform Fire Code Plans and Inventory Requirements.

The Unified Program is intended to provide relief to businesses complying with the overlapping and sometimes conflicting requirements of formerly independently managed programs. The Unified Program is implemented at the local government level by CUPAs. Most CUPAs have been established as a function of a local environmental health or fire department. Some CUPAs have contractual agreements with another local agency, a participating agency, which implements one or more Program Elements in coordination with the CUPA.

Health and Safety Code, Section 25500 et seq.

This code and the related regulations in 19 California Code of Regulations (CCR) 2620, et seq., require local governments to regulate local business storage of hazardous materials in excess of certain quantities. The law also requires that entities storing hazardous materials be prepared to respond to releases. Those using and storing hazardous materials are required to submit a Hazardous Materials Business Plan (HMBP) to their local Certified Unified Program Agency (CUPA) and to report releases to their CUPA and the State Office of Emergency Services (OES).

Health and Safety Code, Section 25531 et seq.

This code and the CalARP regulate the registration and handling of regulated substances. Regulated substances are any chemicals designated as an extremely hazardous substance by the U.S. EPA as part of its implementation of SARA Title III. Health and Safety Code Section 25531 overlaps or duplicates some of the requirements of SARA and the CAA. Facilities handling or storing regulated substances at or above threshold reportable quantities must register with their local CUPA and prepare a Risk Management Plan (RMP).

CCR Title 8, Section 5189

Hazardous Materials Release Response Plans and Inventory Act of 1985

The Hazardous Materials Release Response Plans and Inventory Act, also known as the Business Plan Act, requires businesses using hazardous materials to prepare a plan that describes their facilities, inventories, emergency response plans, and training programs. Business plans contain basic information on the location, type, quantity, and health risks of hazardous materials stored, used, or disposed.

Hazardous Waste Control Act (HWCA)

The HWCA created the State hazardous waste management program, which is similar to but more stringent than the federal RCRA program. The act is implemented by regulations contained in Title 26 of the CCR, which describes the following required aspects for the proper management of hazardous waste: identification and classification; generation and transportation; design and permitting of recycling treatment, storage and disposal facilities; operation of facilities and staff training; closure of facilities; and liability requirements. These regulations list more than 800 materials that may be hazardous and establish criteria for identifying, packaging, and disposing of such waste. Under the HWCA and Title 26, the generator of hazardous waste must complete a manifest that accompanies the waste from generator to transporter to the ultimate disposal location. Copies of the manifest must be filed with the DTSC.

California Public Resources Code Sections 4427 et seq., Fire Safety Regulations

The California Public Resources Code (PRC) includes fire safety regulations that restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors[2] on construction equipment that use an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire suppression equipment that must be provided onsite for various types of work in fire-prone areas. These regulations include the following:

1. Earthmoving and portable equipment with internal combustion engines would be equipped with a spark arrestor to reduce the potential for igniting a wildland fire (PRC Section 4442);
2. Appropriate fire suppression equipment would be maintained during the highest fire danger period – from April 1 to December 1 (PRC Section 4428);
3. On days when a burning permit is required, flammable materials would be removed to a distance of 10 feet from any equipment that could produce a spark, fire, or flame, and the construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427);and

[2] A spark arrestor is a device that prohibits exhaust gases from an internal combustion engine from passing through the impeller blades where they could cause a spark. A carbon trap is commonly used to retain carbon particles from the exhaust.

4. On days when a burning permit is required, portable tools powered by gasoline-fueled internal combustion engines would not be used within 25 feet of any flammable materials (PRC Section 4431).

In addition, fire regulations require that an entity that owns or operates a structure upon or adjoining land that is covered with flammable material, such as forest, brush or grass-covered land, maintain a defensible space of at least 100 feet from the structure (PRC Section 4291).

3.13.2.3 State and Local Agencies

California Environmental Protection Agency (Cal/EPA)

Cal/EPA is charged with developing, implementing, and enforcing the state's environmental protection laws that address clean air, clean water, clean soil, safe pesticides and waste recycling and reduction.

California Occupational Safety and Health Administration (Cal/OSHA)

Cal/OSHA is the primary agency responsible for worker safety in the handling and use of chemicals in the workplace. Cal/OSHA standards are generally more stringent than federal regulations. The employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR Sections 337-340). The regulations specify requirements for employee training, availability of safety equipment, accident-prevention programs, and hazardous substance exposure warnings.

California Highway Patrol (CHP)

A valid Hazardous Materials Transportation License, issued by the CHP, is required by the laws and regulations of State of California Vehicle Code Section 3200.5 for transportation of hazardous materials shipments for which the display of placards is required by State regulations; or hazardous materials shipments of more than 500 pounds, which would require placards if shipping greater amounts in the same manner.

Additional requirements on the transportation of explosives, inhalation hazards, and radioactive materials are enforced by the CHP under the authority of the State Vehicle Code. Transportation of explosives generally requires consistency with additional rules and regulations for routing, safe stopping distances, and inspection stops (Title 14, CCR, Chapter 6, Article 1, Sections 1150-1152.10). Inhalation hazards face similar, more restrictive rules and regulations (Title 13, CCR, Chapter 6, Article 2.5, Sections 1157-1157.8).

California Office of Emergency Services (OES)

In order to protect the public health and safety and the environment, the California OES is responsible for establishing and managing statewide standards for business and area plans relating to the handling and release or threatened release of hazardous materials. Basic information on hazardous materials handled, used, stored, or disposed of (including location, type, quantity, and the health risks) needs to be available to firefighters, public safety officers, and regulatory agencies and needs to be included in business plans in order to prevent or mitigate the damage to the health and safety of persons and the environment from the release or threatened release of these materials into the workplace and environment. These regulations are covered under Chapter 6.95 of the California Health and Safety Code Article 1–Hazardous Materials Release Response and Inventory Program (Sections 25500 to 25520) and Article 2–Hazardous Materials Management (Sections 25531 to 25543.3).

California Regional Water Quality Control Board (RWQCB), Lahontan Region

The mission of the nine RWQCBs is to develop and enforce water quality objectives and implementation plans that will best protect the State's waters. The RWQCB regulates wastewater discharges to surface waters and to groundwater; storm water discharges from construction, industrial, and municipal activities; discharges from irrigated agriculture; dredge and fill activities; the alteration of any federal water body under the 401 certification program; and other activities that could degrade water quality.

Mono County Health Department Environmental Health Division

Mono County Health Department is the local CUPA responsible for implementing the HMBP program. As required, all business that handle hazardous materials in reportable quantities must submit a HMBP providing a hazardous materials inventory, storage location, and other information relevant to hazardous materials emergency response.

Mono County Office of Emergency Services

The Mono County OES coordinates the activities of all County Departments relating to preparation and implementation of the County's Emergency Plan. The Mono County OES also coordinates the response efforts of local, state, and federal agencies to ensure maximum effect with minimum overlap and confusion. The Mono County Code designates the Sheriff-Coroner as the County Director of Emergency Services.

Long Valley Fire Protection District

The LVFPD provides fire protection to approximately 114 square miles of public and private lands along U.S. Highway 395 in Long Valley. The district boundaries include the Mammoth Pacific Geothermal Plant facilities (Mono County LAFCO, 2009). The LVFPD would be the first responder to the proposed power plant area.

Inyo National Forest Fire Management

The Inyo National Forest and BLM-Bishop Field Office have an Interagency Fire Management Organization, working together to manage wildfires in an area covering over 2 million acres. The Interagency Fire Management Organization maintains 8 fire stations with 9 engines; the nearest station is located on SR 203 in the Town of Mammoth Lakes (Inyo National Forest, 2011).

Mammoth Lakes Fire Protection District

The Mammoth Lakes Fire Department (MLFPD) is a fire protection district serving the Mammoth Lakes community. The District boundaries encompass approximately 24 square miles near the Town of Mammoth Lakes. MLFPD has a mutual aid agreement with the Long Valley Fire Protection District to provide assistance if available.

Mono County Paramedic Fire/Rescue

Mono County Paramedic Fire/Rescue provides pre-hospital emergency care and ambulance transportation for the Project area. Receiving hospitals include Mammoth Hospital in the Town of Mammoth Lakes, Northern Inyo Hospital in Bishop, and Carson Valley Medical Center in Gardenerville, Nevada.

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3.14 Recreation

This section describes the environmental setting and applicable policies and regulations associated with construction and operation of the Proposed Action or its Alternatives with respect to recreation resources that may be present in the Project area. For the purposes of this analysis, the recreation study area has been defined as the Proposed Action area. Recreation resources within a ¼ mile of the Proposed Action area are also described in this analysis.

3.14.1 Environmental Setting

3.14.1.1 Recreational Resources within the Proposed Action Area

Shady Rest Park

The closest recreational facility to the Proposed Action area is Shady Rest Park, which is located off Sawmill Cutoff Road (NFSR 03S08). Shady Rest Park is also accessible to pedestrians and bicyclists via a paved path that extends north from Main Street and generally parallels the eastern side of Sawmill Cutoff Road (NFSR 03S08). Shady Rest Park and the paved path are municipal facilities on Inyo National Forest lands managed under permit by the Town of Mammoth Lakes. Managed by the Town of Mammoth Lakes, Shady Rest Park includes playground equipment, a sheltered picnic area, restroom facilities, picnic tables, sand volleyball courts, softball fields, soccer fields, a concession stand, a small skate-park, and a parking area. As weather permits, Shady Rest Park is open between May and November 1st. During the summer months, Shady Rest Park is used by soccer camps such as U.K. International Soccer Camp and American Youth Soccer Organization Advanced Soccer Training Camp for kids. The softball fields are also used by adult softball leagues during summer time (Town of Mammoth Lakes, 2011). During winter months, the park is covered in snow and is not maintained (Town of Mammoth Lakes, 2009). There is no lighting at the park so recreational use is generally limited to daytime hours. The Town of Mammoth Lakes has proposed the construction of additional park facilities including an ice skating rink and winter trails to establish the park as a staging area for winter recreational activities. However, the USFS has not indicated any intent to approve these additional activities.

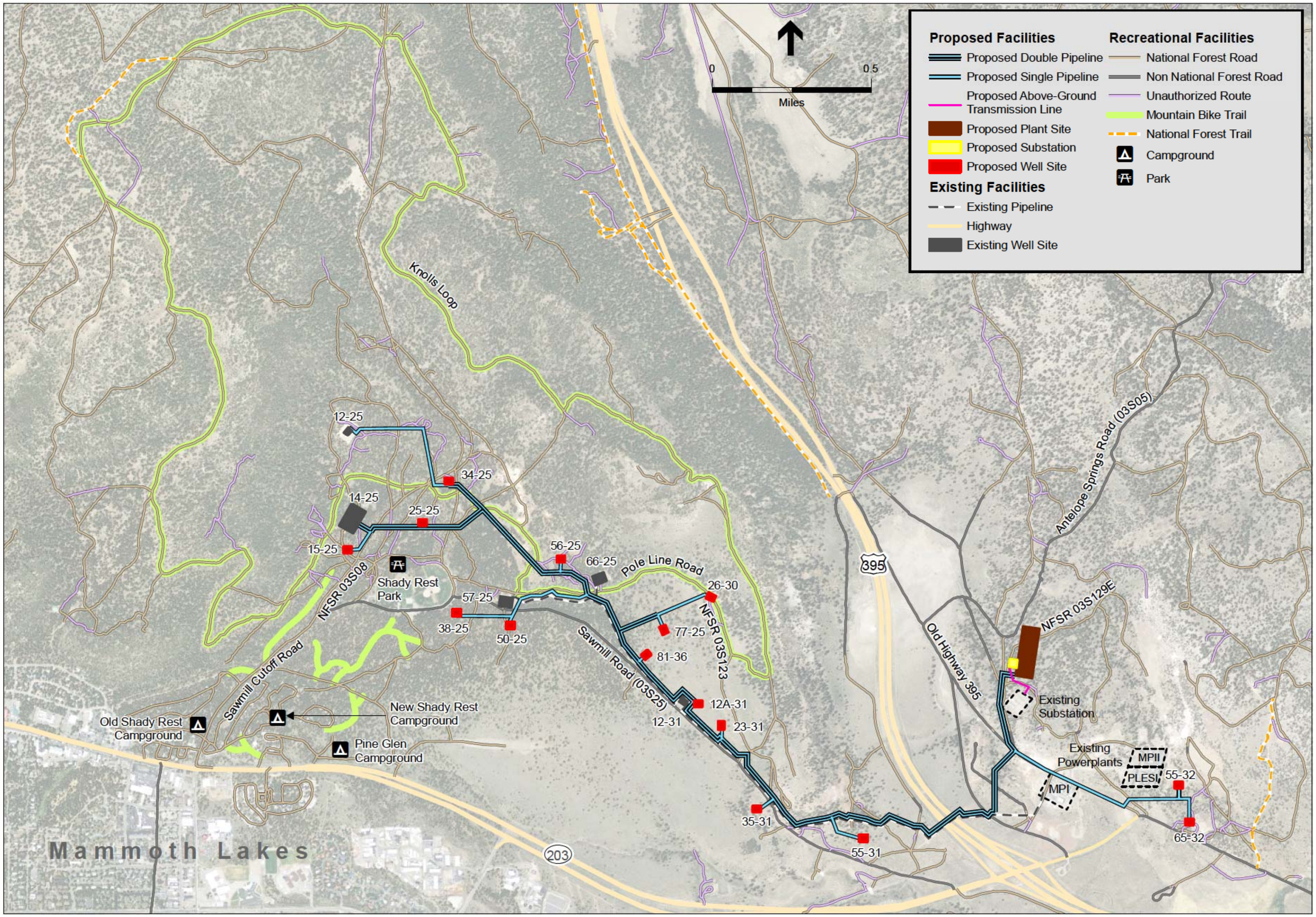
Bicycle Routes

SR 203 is a Class III bicycle route consistent with the California Highway Design Manual.

Trails and USFS Roads

As shown in Figure 3.14-1, the Proposed Action area consists of an extensive network of National Forest Roads and trails, many of which are used by various recreationists. During the summer time, recreational uses of these roads include walking, jogging, bicycling, and OHV uses.

Forest Service roads include National Forest System Roads (NFSR), which are designated roads included in the National Forest's transportation system available for motorized and non-motorized recreation use, and 'unauthorized roads', which are closed to motorized use available to non-motorized recreation use.



SOURCE: USFS, 2011; Ormat, 2011

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.14-1

Recreational Facilities

A system of mountain bike routes and a mountain bike single track have been established along several roads and trails within the Proposed Action area and vicinity. All of the NFSRs and unauthorized roads in the Project vicinity are available for mountain bike use, and some winter recreation paths are used as mountain bike routes. One popular route is the Knolls Loop, a 10-mile mountain biking route that begins near the Shady Rest Campground on a paved bike path, follows some dirt roads to the north, and ends near Shady Rest Park (Figure 3.14-1). In general, recreational use of these roads and trails during the spring, summer, and fall months is considered moderate (Town of Mammoth Lakes, 2009).

During the winter months, these trails and NFSRs are used for walking, snowmobiling, cross-country skiing, and snowshoeing. The parking lot at Shady Rest Park serves as a main staging area for snowmobilers, who generally exit to the north since the area to the south of Shady Rest Park and Sawmill Road (03S25) is prohibited to over snow vehicles (OSV) (Figure 3.14-2). From this staging area is a system of signed and unsigned, groomed and un-groomed, snowmobile and cross country ski trails that are open to the public. Groomed trails are maintained by the USFS with State funded grants and Mammoth Nordic (a non-profit user group) with private donations. Both Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08) are used by the public and USFS staff for snowmobile riding and skiing. USFS is responsible for grooming the snow on top of Sawmill Cutoff Road (NFSR 03S08) (indicated by orange diamond trail marker) and pre-grooming of various cross-country trails in the Shady Rest area (indicated by blue diamond trail markers). The USFS has promulgated Best Management Practices for snow plowing on native surface roads in order to prevent or reduce erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities (See Appendix B, USFS, 2012b).

The adjacent paved multi-use path connecting Main Street to Shady Rest Park is groomed by Mammoth Nordic. Sawmill Cutoff Road (NFSR 03S08) is open to both motorized and non-motorized uses, while the path is open to non-motorized uses (i.e., Nordic skiing and snow shoeing) only. In addition, approximately 2.57 miles of soft-surface trails to the south of Shady Rest Park are groomed during winter months, which are open to non-motorized uses only (Town of Mammoth Lakes, 2009).

NFSR Maintenance Levels

The physical characteristics of NFSRs are classified by maintenance level. Characteristics range from Level 1, which is a road that is intermittently closed and Level 2 which are only open to high clearance vehicles (not standard passenger cars), to Level 5, which are normally a double lane, paved facility. Most of the NFSRs in the Project area are Maintenance Level 2 roads (see Table 3.14-1). Maintenance levels are summarized below:

> **Level 1:** A road that has been placed in storage between intermittent uses. The period of storage must exceed 1 year and basic custodial maintenance is performed to prevent damage to adjacent resources. These roads are not shown on motor vehicle use maps.
>
> **Level 2:** Assigned to roads open for use by high clearance vehicles only. Passenger car traffic, user comfort and user convenience are not considered. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation and other specialized uses.

Level 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this level are typically low speed with single lanes or turnouts.

Level4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate speeds. Most roads are double lane and aggregate surfaced; however, some roads may be single lane. Some roads may be paved and/or dust abated.

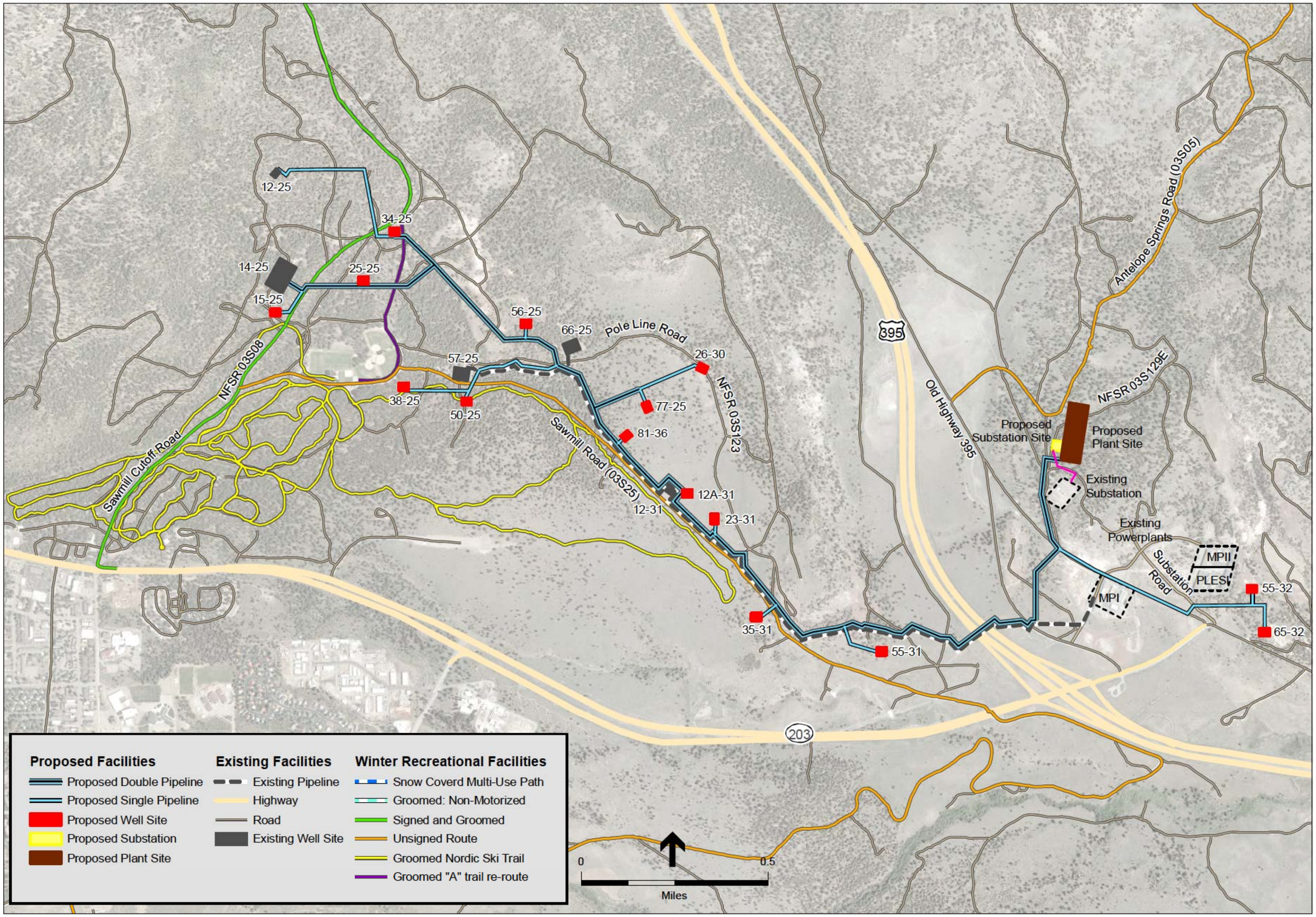
Level 5: Assigned to roads that provide a high degree of user comfort and convenience. Normally double lane, paved facilities, although some may be aggregate surfaced.

TABLE 3.14-1
ROAD MAINTENANCE LEVELS IN THE PROJECT AREA

Road	Maintenance Level
NFSR 03S129E	2- High Clearance Vehicles
NFSR 03S35C	2- High Clearance Vehicles
NFSR 03S35D and NFSR 03S35E	2- High Clearance Vehicles
NFSR 03S08S	2- High Clearance Vehicles
Pole Line Road (03S123)	2- High Clearance Vehicles
Sawmill Cutoff Road (03S08)	3- Suitable for Passenger Cars and 4- Moderated Degree of User Comfort (south of Shady Rest Park)
NFSR 03S36	2- High Clearance Vehicles
NFSR 03S08N and 03S08P	2- High Clearance Vehicles
NFSR 03S25J	2- High Clearance Vehicles
U-N 1134	2- High Clearance Vehicles
NFSR 03S123	2- High Clearance Vehicles

3.14.1.2 Recreational Resources in the Vicinity of the Proposed Action Area

Recreational resources located just southwest of the Proposed Action area include the Pine Glen Group Campground, New Shady Rest Campground, and the Old Shady Rest Campground. All three of these campgrounds are managed by USFS and are located just north of SR 203. The Pine Glen Group Campground consists of 18 tent and RV campsites and is open late-April through late-September. New Shady Rest, accessible off of Sawmill Cutoff Road (NFSR 03S08), consists of 93 campsites and is typically open between late-April and late-October. Old Shady Rest Campground has 46 sites and is typically open between early June and early September (USFS, 2011). Dispersed camping (camping outside of designated campgrounds) is allowed throughout large portions of the Inyo National Forest. Dispersed camping is only allowed outside of designated wilderness. The majority of the Project area is closed to dispersed camping. A wilderness permit is required to camp overnight and a campfire permit is required for campfires, using a stove, or cooking with a barbeque or grill outside of developed recreation areas. Further, some high-use recreation zones, including those along paved roads leading into the mountains, are not open to dispersed camping (USFS, 2012a). For instance, there is a no dispersed camping zone along Sawmill Cutoff Road (NFSR 03S08) and to the east and west of Sawmill Cutoff Road (NFSR 03S08) for 3 miles from SR 203.



SOURCE: Ormat, 2011; TOML, 2009; TSMP, 2011

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.14-2

Winter Recreation Activities

3.14.2 Applicable Regulations, Plans, and Policies / Management Goals

3.14.2.1 Federal

Inyo National Forest Land and Resource Management Plan (LRMP)

The LRMP provides management direction for those portions of the Project area within Inyo National Forest. The entire surface disturbance associated with the Proposed Action is located within Management Area #9 (Mammoth). Chapter 4 of the LRMP contains management prescriptions, which prescribe how areas of the forest should be managed by resource topic. Both Management Prescription 12 (Concentrated Recreation Area) and Management Prescription 15 (Developed Recreation Site) apply to the Project area.

The purpose of Management Prescription 12 is to manage concentrated recreation areas to maintain or enhance major recreational values and opportunities. The emphasis is on providing a broad range of facilities and opportunities that will accommodate large numbers of people safely, conveniently, and with little resource damage. Other resource activities will not be prohibited, but they are secondary to recreational values and use and should not detract from them (USFS, 1988).

The purpose of management Prescription 15 is to maintain developed recreational facilities to provide necessary user services and to protect Forest Service values. The emphasis is on the recognition of public demand for developed recreation site opportunities. This prescription is applied to all existing and potential developed sites, whether publicly-operated or concessionaire-operated (USFS, 1988).

Management Area #9 (Mammoth) includes several management directions that are specific to recreation and applicable to the Project area:

1. Maintain open-space areas adjacent to the Town of Mammoth Lakes for passive recreation use.
2. Prohibit development of Shady Rest Park beyond existing perimeter roads, and north of the power line right-of-way.
3. Identify and program the expansion potential of the Shady Rest and Sherwin Creek Campground complexes and develop as funds become available (USFS, 1988).

3.14.2.2 State

No state regulations apply to the Proposed Action.

3.14.2.3 Local

Mono County General Plan

The Conservation/Open Space Element of the Mono County General Plan states that natural resource based outdoor recreation is and will continue to be the foundation of Mono County's economy (Mono County, 1993). Since much of the recreation in Mono County takes place on federal lands, the plan recognizes that federal land management agencies would develop the policies and facilities for the recreational use of those lands. Therefore, Mono County General Plan policies pertaining to recreational uses on open space land would not apply to the Proposed Action.

Town of Mammoth Lakes General Plan

The Parks and Recreation Element of the Town of Mammoth Lakes General Plan (2007) contains several policies which are applicable to the Proposed Action:

> *Policy P.3.A*: Ensure public routes for access to public lands are provided in all developments adjacent to National Forest lands.
>
> *Policy P.3.B*: Coordinate with multiple organizations, agencies and jurisdictions to plan, steward, interpret, promote and sustain trails, public access and outdoor recreation amenities in the Mammoth Lakes region.
>
> *Policy P.4.A*: Expand recreational opportunities by proactively developing partnerships with public agencies and private entities.
>
> *Policy P.4.C*: Ensure balance of use, enjoyment and separation where appropriate between motorized and non-motorized modes of recreation.

Mammoth Lakes Trail System Master Plan

The Town of Mammoth Lakes Trail System Master Plan (2009) includes a variety of recommendations for the Town of Mammoth Lake's existing and future trail system. The development of this plan meets the 2007 General Plan's Open Space and Recreation Goal, which aims to "create a Master Plan for an integrated trail system that will maintain and enhance convenient public access to public lands from town." One of the key goals of the plan is to develop a plan for an integrated year-round trail network that provides for seamless transition between the Town of Mammoth Lakes, the Mammoth Mountain Ski Area Mountain Bike Park, and the surrounding federal lands overseen by the USFS. The following recommendations apply to the proposed Project:

> *Recommendation INT1: General Interface Considerations*: Develop partnership with TOML (Town of Mammoth Lakes), USFS and MMSA (Mammoth Mountain Ski Area) to analyze and address all interface areas, including a combination of rerouting, signage, education, alternative facilities and other methods as necessary.
>
> *Recommendation SS2: Summer Soft-Surface Trails outside the UGB*: Develop new soft-surface trails outside the urban growth boundary (UGB) in the Shady Rest, Knolls and Sherwin areas.
>
> *Recommendation SS3: Shady Rest Winter Trails*: Explore options to improve winter trail and trailhead conditions at Shady Rest.

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3.15 Socioeconomics and Environmental Justice

This section describes the socioeconomic and demographic setting for the Project and alternatives. Following industry-standard practice in the analysis of economic impacts, the primary study area is defined as Mono County. Mono County is a largely rural county, with only one incorporated town, Mammoth Lakes. Additionally, this section discusses applicable plans, policies, and regulations that represent the social aspirations, community characteristics, and desired lifestyle, values, and goals of the stakeholders. These plans, policies, and regulations are necessary to understanding social group concerns in the context of renewable energy development. Information in this section is based on regional and national sources.

3.15.1 Environmental Setting

3.15.1.1 Population and Demographic Characteristics

The most recent population and demographics statistics for the study area are now available from the 2010 U.S. Census, and are presented in Table 3.15-1 along with a comparison to the 2000 Census population statistics. As can be seen in the table, the majority of the Mono County population resides within the incorporated Town of Mammoth Lakes. Population in the county has been growing at approximately the same pace as California as a whole, although the Town of Mammoth Lakes has been growing somewhat faster over the past decade. Selected age characteristics presented in the table show that while the study area has similar proportions of children, there are relatively few permanent residents of retirement age in Mono County compared with California as a whole.

TABLE 3.15-1
COMPARISON OF STUDY AREA POPULATION AND AGE CHARACTERISTICS

Population and Age Characteristics	Mammoth Lakes	Mono County	California
Population, 2010	8,234	14,202	37,253,956
Population, percent change, 2000 to 2010	16.1%	10.5%	10.0%
Population, 2000	7,093	12,853	33,871,648
Persons under 5 years, percent, 2010	6.3%	6.3%	6.8%
Persons under 18 years, percent, 2010	20.9%	21.0%	25.0%
Persons 65 years and over, percent, 2010	6.5%	9.7%	11.4%
Female persons, percent, 2010	45.2%	46.9%	50.3%

SOURCE: U.S. Census Bureau, 2012

Using CA DOF data, projected population growth also is presented in Table 3.15-2. In percentage terms, Mono County is expected to grow more rapidly than the state of California as a whole; however, because this growth is occurring on such a small base, it amounts to only a few thousand new residents per decade.

TABLE 3.15-2
PROJECTED POPULATION GROWTH IN MONO COUNTY THROUGH 2050

Project Population Growth	2000	2010	2020	2030	2040	2050
Mono County	13,013	14,833	18,080	22,894	29,099	36,081
Percentage Change		14%	22%	27%	27%	24%
California	34,105,437	39,135,676	44,135,923	49,240,891	54,226,115	59,507,876
Percentage Change		15%	13%	12%	10%	10%

SOURCE: CA DOF, 2007

Both Mono County and the Town of Mammoth Lakes are notably lacking in concentrations of minority populations. As can be seen in Table 3.15-3, more than 80 percent of the population of both the County and of Mammoth Lakes is white; and, across all categories of ethnic composition, the minority communities are proportionately smaller in the study area than they are within California statewide.

TABLE 3.15-3
COMPARISON OF STUDY AREA ETHNIC COMPOSITION

Ethnic Composition of Study Area	Mammoth Lakes	Mono County	California
White persons, percent 2010[a]	80.7%	82.4%	57.6%
Black persons, percent, 2010[a]	0.4%	0.3%	6.2%
American Indian and Alaska Native persons, percent, 2010[a]	0.6%	2.1%	1.0%
Asian persons, percent, 2010[a]	1.6%	1.4%	13.0%
Native Hawaiian and other Pacific Islander, percent, 2010[a]	0.1%	0.1%	0.4%
Persons reporting two or more races, percent 2010	2.8%	2.9%	4.9%
Persons of Hispanic or Latino origin, percent, 2010[b]	33.7%	26.5%	37.6%
White persons not Hispanic, percent, 2010	62.5%	68.2%	40.1%

NOTES:

[a] Includes persons reporting only one race.
[b] Hispanics may be of any race, so also are included in applicable race categories.

SOURCE: U.S. Census Bureau, 2012

3.15.1.2 Availability of Housing

The majority of the housing units in Mono County are in the Town of Mammoth Lakes, and much of those are designed to serve as seasonal accommodations for people attracted by the ski area at Mammoth Mountain during the wintertime. As can be seen in Table 3.15-4, almost 10,000 of the county's 14,000 housing units are in Mammoth Lakes. The influence of the ski resort community can also be seen in the mix of housing unit types. While less than a third of the housing units in California are in multi-unit structures, over two thirds of the units in Mammoth Lakes are condominiums and rental units in multi-unit buildings.

TABLE 3.15-4
COMPARISON OF STUDY AREA HOUSING CHARACTERISTICS

Housing Characteristics	Mammoth Lakes	Mono County	California
Housing units, 2010	9,626	13,912	13,680,081
Homeownership rate, 2006-2010	48.5%	56.4%	57.4%
Housing units in multi-unit structures, percent, 2006-2010	70.9%	51.1%	30.7%
Median value of owner-occupied housing units, 2006-2010	$729,700	$481,300	$458,500
Households, 2006-2010	2,805	5,283	12,392,852
Persons per household, 2006-2010	2.82	2.61	2.89

SOURCE: U.S. Census Bureau, 2012

Table 3.15-5 presents even more dramatic evidence of the predominance of the resort environment in Mono County. Less than half (41.5 percent) of all housing units in the county are occupied by permanent residents, and fully 45.9 percent of units were listed in the 2010 U.S. Census as being held for seasonal, recreational, or occasional use by their owners. Of the housing units available for rent, fully a quarter of them (28.5 percent) were vacant at the time of the Census. More than 1,100 units were listed as immediately available for rent.

TABLE 3.15-5
HOUSING OCCUPANCY CHARACTERISTICS IN MONO COUNTY

Mono County Housing Occupancy	Number	Percent
Housing Occupancy		
Total housing units	13,912	100.0%
Occupied housing units	5,768	41.5%
Vacant housing units	8,144	58.5%
For rent	1,125	8.1%
Rented, not occupied	289	2.1%
For sale only	118	0.8%
Sold, not occupied	20	0.1%
For seasonal, recreational, or occasional use	6,383	45.9%
All other vacant	209	1.5%
Homeowner vacancy rate (percent)[a]	3.5%	(X)
Rental vacancy rate (percent)[b]	28.5%	(X)
Housing Tenure		
Occupies housing units	5,768	100.0%
Owner-occupied housing units	3,228	56.0%
Population in owner-occupied housing	7,449	(X)
Average household size of owner-?	2.31	(X)
Renter-occupied housing units	2,540	44.0%
Population in renter-occupied housing	6,531	(X)
Average household size of renter-?	2.57	(X)

NOTES:
X = Not applicable
[a] The homeowner vacancy rate is the proportion of the homeowner inventory that is vacant “for sale.” It is computed by dividing the total number of vacant units for sale only” by the sum of owner-occupied units, vacant units that are “for sale only,” and vacant units that have been sold but not yet occupied; and then multiplying by 100.
[b] The rental vacancy rate is the proportion of the rental inventory that is vacant “for rent.” It is computed by dividing the total number of vacant units “for rent” by the sum of the renter-occupied units, vacant units that are “for rent,” and vacant units that have been rented by not yet occupied, and then by multiplying by 100.

SOURCE: U.S. Census Bureau, 2010

3.15.1.3 Income, Employment, and Unemployment

Incomes in the study area are slightly lower, but comparable to the per capita average and median household income for California as a whole (Table 3.15-6). Also notable is that the concentration of people living below the poverty line in the study area is comparable to the statewide average. As shown in Table 3.15-6, poverty in Mono County is only slightly less than the statewide average, and slightly more than the state within the Town of Mammoth Lakes.

TABLE 3.15-6
COMPARISON OF STUDY AREA INCOME CHARACTERISTICS

Income Characteristics	Mammoth Lakes	Mono County	California
Per capita money income in past 12 months (2010 dollars) 2006-2101	$26,371	$27,321	$29,188
Median household income 2006-2010	$54,414	$55,087	$60,883
Persons below poverty level, percent, 2006-2010	15.2%	12.0%	13.7%

SOURCE: U.S. Census Bureau, 2012

The most recent employment and unemployment statistics from the California Economic Development Department (EDD) are presented in Table 3.15-7. There are currently approximately 9,000 people in the civilian labor force in Mono County, of which 800, or approximately 9 percent, are unemployed. In recent months, the unemployment rate for the study area has been lower than California's as a whole, but quite comparable to the U.S. average unemployment rate. The predominance of the leisure and hospitality industry can be seen in the table as well, with approximately half of all county jobs in that sector.

3.15.2 Applicable Regulations, Plans, and Policies/ Management Goals

3.15.2.1 Federal

National Environmental Policy Act (NEPA)

Under NEPA (42 USC 4321 et seq.), an EIS must include an analysis of the Proposed Action's economic, social, and demographic effects related to effects on the natural or physical environment in the affected area, but does not allow for economic, social, and demographic effects to be analyzed in isolation from the physical environment.

Environmental Justice

Federal agencies are required to analyze the effects of their decisions on human health and environmental conditions in minority and low-income communities under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994). EPA's *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (EPA, 1998) suggests a screening process to

**TABLE 3.15-7
MONO COUNTY EMPLOYMENT AND UNEMPLOYMENT**

Mono County Employment by Industry with Unemployment Rate

Data Not Seasonally Adjusted	11-Jan	11-Nov	11-Dec Revised	12-Jan Prelim	Percent Change	
					Month	Year
Civilian Labor Force[a]	9,830	8,310	8,950	8,910	-0.4%	-9.4%
Civilian Employment	9,010	7,390	8,110	8,110	0.0%	-10.0%
Civilian Unemployment	820	910	840	800	-4.8%	-2.4%
Civilian Unemployment Rate	8.3%	11.0%	9.4%	9.0%		
(CA Unemployment Rate)	12.7%	10.9%	10.9%	11.3%		
(U.S. Unemployment Rate)	9.8%	8.2%	8.3%	8.8%		
Employment by Industry						
Total, All Industries[b]	7,930	6,460	7,130	7,300	2.4%	-7.9%
Total Farm	20	30	30	20	-33.3%	0.0%
Total Nonfarm	7,910	6,420	7,100	7,270	2.4%	-8.1%
Total Private	6,350	4,820	5,540	5,720	3.2%	-9.9%
Goods Producing	360	400	380	360	-5.3%	0.0%
Manufacturing	50	70	70	70	0.0%	40.0%
Service Providing	7,550	6,030	6,720	6,920	3.0%	-8.3%
Trade, Transportation & Utilities	790	690	740	730	-1.4%	-7.6%
Wholesale Trade	10	10	10	10	0.0%	40.0%
Retail Trade	680	590	640	630	-1.6%	-7.4%
Transportation, Warehousing & Utilities	100	80	90	90	0.0%	-10.0%
Financial Activities	370	300	340	360	5.9%	-2.7%
Professional & Business Services	360	400	370	380	2.7%	5.6%
Educational & Health Services	60	50	50	50	0.0%	-16.7%
Leisure & Hospitality	4,110	2,820	3,520	3,650	3.7%	-11.2%
Private Service Providing –Residual	300	160	140	190	35.7%	-36.7%
Government	1,560	1,610	1,550	1,560	0.6%	0.0%
Federal Government	180	190	160	160	0.0%	-11.1%
State & Local Government	1,390	1,420	1,390	1,400	0.7%	0.7%
State Government	110	120	120	120	0.0%	9.1%
Local Government	1,270	1,310	1,270	1,280	0.8%	0.8%

NOTES:

[a] Civilian labor force data are by place of residence; include self-employed individuals, unpaid family workers, household domestic workers, and workers on strike. Data may not add due to rounding. The unemployment rate is calculated using unrounded data.

[b] Industry employment is by place of work; excludes self-employed individuals, unpaid family workers, household domestic workers, and workers on strike. Data may not add due to rounding.

SOURCE: California Employment Development Department (EDD), 2012a, 2012b; U.S. Bureau of Labor Statistics, 2012

identify environmental justice concerns. If either of the following criteria of the two-step process is unmet, there is little chance of environmental justice effects occurring:

1. Does the potentially affected community include minority and/or low-income populations?

2. Are the environmental impacts likely to fall more heavily on minority and/or low-income members of the community and/or tribal resource?

3.15.2.2 State

California Environmental Quality Act

Title 14 of the California Code of Regulations, Chapter 3, Guidelines for Implementation of the California Environmental Quality Act, Article 9(a), Section 15131, states the following with regard to economic and social effects:

(a) *Economic or social effects of a project shall not be treated as significant effects on the environment. An EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes resulting from the project to physical changes caused in turn by the economic or social changes. The intermediate economic or social changes need not be analyzed in any detail greater than necessary to trace the chain of cause and effect. The focus of the analysis shall be on the physical changes.*

(b) *Economic or social effects of a project may be used to determine the significance of physical changes caused by the project. For example, if the construction of a new freeway or rail line divides an existing community, the construction would be the physical change, but the social effect on the community would be the basis for determining that the effect would be significant. As an additional example, if the construction of a road and the resulting increase in noise in an area disturbed existing religious practices in the area, the disturbance of the religious practices could be used to determine that the construction and use of the road and the resulting noise would be significant effects on the environment. The religious practices would need to be analyzed only to the extent to show that the increase in traffic and noise would conflict with the religious practices. Where an EIR uses economic or social effects to determine that a physical change is significant, the EIR shall explain the reason for determining that the effect is significant.*

(c) *Economic, social, and particularly housing factors shall be considered by public agencies together with technological and environmental factors in deciding whether changes in a project are feasible to reduce or avoid the significant effects on the environment identified in the EIR. If information on these factors is not contained in the EIR, the information must be added to the record in some other manner to allow the agency to consider the factors in reaching a decision on the project.*

3.15.2.3 Local

The Mono County Board of Supervisors is concerned about the need to stimulate the local economy and to create jobs, and has adopted a "Mono County Job Creation Plan" (1999). The Board also oversees an Economic Development Department.

The Economic Development Department strives to enhance the economic base of Mono County through job creation, by promoting tourism, and developing and enhancing the natural resources of Mono County.

3.16 Traffic, Transportation, and Circulation

This section describes existing conditions related to traffic, transportation and circulation, including applicable plans, policies, and regulations.

3.16.1 Environmental Setting

3.16.1.1 Regional and Local Roadway Facilities

Typical construction traffic would consist of trucks transporting construction equipment and materials, and vehicles of construction employees commuting, to and from the Project site. The Project site is located in Mono County, approximately two miles from Mammoth Lakes, California. Construction materials would be transported from long distances (e.g., Los Angeles), and construction workers would likely commute to the Project site from nearby communities, including Mammoth, Bishop, and Lee Vining. Regional access to the sites is from U.S. Highway 395 and SR 203, and local access would be from Antelope Spring Road, Casa Diablo Cutoff Road, Sawmill Road (03S25), Sawmill Cutoff Road (NFSR 03S08), and existing NFSRs, as well as access routes proposed to be constructed as a part of the Project (see Figure 2-8, Project Access Roads).

3.16.1.2 CD-IV Access

Regional Access

U.S. Highway 395 is a north-south highway that traverses the entire state of California. The highway extends from its junction at Interstate 15 to the south (in San Bernardino County) northward to its terminus in Canada. The roadway is classified as a Principal Arterial in the Mono County General Plan and is managed by the State of California Department of Transportation (Caltrans). In proximity to the Project site, U.S. Highway 395 is a divided, four-lane freeway that provides regional transportation connections to various destination locations throughout the state. In Mono County, the route is incorporated in the Interregional Road System and is a designated roadway in the National Highway System (Mono County, 2009). The most recent data published by Caltrans indicates that the Annual Average Daily Traffic (AADT) on the roadway is about 4,650 vehicles, and trucks comprise about 13 percent of daily traffic along the highway (Caltrans, 2011, 2010a). The posted speed limit is 65 miles per hour (mph).

California State Route 203 (SR 203) is an east-west highway that extends from its junction at U.S. Highway 395 to the east to its terminus at Reds Meadow Road (NFSR 03S11). The roadway is classified as a Minor Arterial for the first 8.3 miles from its junction at U.S. Highway 395 through the Town of Mammoth Lakes, and becomes a Minor Collector roadway the remaining 0.7 mile to its terminus (Mono County, 2009). In proximity to the Project site, the roadway is a divided, four-lane arterial roadway and becomes a two-lane roadway within the Mammoth Lakes Town Limits. SR 203 is generally used for local and recreational traffic to and from Mammoth Lakes. Specifically, this road serves access for many other recreation areas in the Mammoth area, including Mammoth Mountain. Recent Caltrans traffic count data indicates the AADT on the roadway is about 7,950 vehicles, and trucks comprise about five percent of daily traffic along the highway (Caltrans, 2011, 2010a). The posted speed limit is generally 55 mph; however, the posted speed limit is 35 mph within the Town of Mammoth Lakes. SR 203 is a designated emergency access route for the Town of Mammoth Lakes (Caltrans, 2007).

Local Access

Antelope Springs Road is generally an east-west roadway that extends from Owens River Road to the east to its junction with U.S. Highway 395 to the west. The roadway is operated and maintained by Mono County; and, because this road is partially located on National Forest land, the USFS has also numbered the road 03S05. The roadway includes one travel lane in each direction.

Casa Diablo Cutoff Road is a north-south roadway that extends from Antelope Springs Road to the south to Old Highway 395 to the north. This County-maintained roadway provides direct access to the Casa Diablo power plants.

Old Highway 395 is a north-south roadway that runs parallel to U.S. Highway 395. The roadway extends from its junction at U.S. Highway 395 to the south to its junction at Antelope Springs to the north. The roadway is operated and maintained by Mono County; and, because this road is partially located on National Forest land, the USFS has also numbered the road 04S102. The roadway provides direct access to the existing Casa Diablo power plants and includes one travel lane in each direction.

Sawmill Road (03S25) is an east-west roadway that extends from SR 203 to the east to Sawmill Cutoff Road (03S08) to the west. The roadway is operated and maintained by the Mono County; and, because this road is partially located on National Forest land, the USFS has also numbered the road 03S25. The roadway mostly includes one travel lane in each direction; however, the portion that leaves the paved park area near the existing geothermal facility is single lane.

Sawmill Cutoff Road (03S08) is a north-south roadway that extends from SR 203 to the south to its junction with U.S. Highway 395 to the north. The roadway is a NFSR and is operated and maintained by the USFS. The USFS has designated the roadway as NFSR 03S08. The road is of variable width; however, it is double lane for the paved portion, and generally single lane for the unpaved portion.

Site Access

Figure 2-2 in Chapter 2, Proposed Action and Alternatives, illustrates the locations of each planned facility. Regional access to the Proposed Action would be via two Caltrans facilities: U.S. Highway 395 and SR 203. One full interchange along U.S. Highway 395 (with northbound and southbound on- and off-ramps) is located at SR 203.

The proposed power plant would be located near the three existing geothermal plants. Therefore, access would be gained from Casa Diablo Cutoff Road via SR 203 and additional NFSRs (i.e., NFSR 03S129 and NFSR 03S129C). Vehicles may also utilize other County-maintained roads, including Substation Road or Old Highway 395 to access the planned facility.

The alternative power plant site would also be accessed from Old Highway 395 via SR 203 and NFSR 03S130 would provide access to the alternative plant site from Old Highway 395.

Access to well pad locations and adjacent pipelines would be gained from various existing NFSRs as well as access routes proposed to be constructed as a part of this Project. Access to each planned facility is shown in Figure 2-8 and outlined below:

Planned Well/Pipeline	Access Road/Route
Well Pad #55-32	New access road via unauthorized [1] U-N1248 and Old Highway 395
Well Pad #65-32	New access road via Old Highway 395
Well Pad #55-31	New access road via Sawmill Road (03S25)
Well Pad #35-31	New access road via Sawmill Road (03S25)
Well Pad #23-31	New access road via Sawmill Road (03S25)
Well Pad #12A-31	New access road via Sawmill Road (03S25)
Well Pad #81-36	New access road via Sawmill Road (03S25)
Well Pad #38-25	New access road via NFSR 03S25k and Sawmill Road (03S25)
Well Pad #50-25	NFSR 03S25J via Sawmill Road (03S25)
Well Pad #77-25	New access road via Sawmill Road (03S25)
Well Pad #26-30	New access road via NFSR 03S123and Sawmill Road (03S25)
Well Pad #56-25	Unauthorized U-N1134 via NFSR 03S123
Well Pad #15-25	NFSR 03S08S via NFSR 03S08
Well Pad #34-25	New access road via NFSR 03S08N
Well Pad #25-25	New access road via unauthorized U-N1109 via NFSR 03S36

3.16.1.3 Public Transportation within the Vicinity of the CD-IV Project

Mammoth Yosemite Airport

The nearest airport facility to the CD-IV site is the Mammoth Yosemite Airport. The airport is a public facility located approximately six miles east of the Town of Mammoth Lakes and approximately four miles east of the CD-IV site. The airfield has been open since 1947, and has one operating runway and no control tower. Runway 9-27 is 7,000 feet long and 100 feet wide. Today, Mammoth Yosemite Airport is primarily used for general aviation (i.e., flights other than military and regularly-scheduled airline service and regular cargo flights) and regularly scheduled commercial service.

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[1] National Forest System Roads (NFSR) include ‘system’ roads, which are designated roads included in the National Forest’s transportation system, and ‘unauthorized’ roads, which range from narrow singletrack routes used by motorcycles, to wider routes passable by trucks and other full-size vehicles. By definition, a ‘system’ road is a “forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority” and an ‘unauthorized’ road is “a road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas”. According to Title 36 CFR part 212, ‘system and non-system’ roads are referred to as ‘authorized and unauthorized’ roads. Although many of these routes are being used by the public to recreate on the national forest, none of them are currently part of the official transportation system. If unauthorized routes have not been designated and converted into a NFSR or NFST, motor vehicle use on these roads is currently prohibited. Any unauthorized routes approved as part of this project would be converted into a NFSR.

Current operations at Mammoth Yosemite Airport are limited. For the 12-month period ending in December 2010, aircraft operations averaged 23 takeoffs or landings per day or about 8,400 operations per year. Of these, approximately 45 percent were characterized as transient general aviation; approximately 23 percent local general aviation, 20 percent air taxi, 12 percent commercial, and less than 1 percent military (Airnav, 2012).

Bus Service

There are several transit operators throughout Mono County, including the Eastern Sierra Transit Authority (ESTA) and its interregional service, Carson Ridgecrest Eastern Sierra Transit (CREST), which provides local and regional services to various communities. Other transit providers include the Yosemite Area Regional Transportation System, Mammoth Lakes Transit Service, and other shuttle-based operators that provide service for many regional and local attractions, ski resorts, recreational areas, and municipal airports (Mono County, 2009).

ESTA provides daily fixed-route bus transit service throughout the Town of Mammoth Lakes and operates along portions of SR 203. ESTA bus service throughout the Town of Mammoth Lakes operates between 7:30 a.m. and 6:30 p.m., with limited morning, midday, and evening scheduled service. CREST regional bus service operates along U.S. Highway 395, and has scheduled service weekdays from Lone Pine to Reno and from Mammoth Lakes to Lancaster and does not provide hourly scheduled services.

Bicycle and Pedestrian Facilities

According to the Mono County General Plan Circulation Element and Regional Transportation Plan (Mono County, 2009), bikeways are classified as Class I (bicycle paths separated from roads), Class II (striped bicycle lanes within the paved areas of roadways), or Class III (signed bike routes that allow cyclists to share streets with vehicles).

SR 203 includes a Class III bicycle route in both directions, and signage is posted to alert drivers of the bicycle facility. There is a Class I bicycle path adjacent to Sawmill Cutoff Road (NFSR 03S08) and circulations in and around an existing campground area east of Sawmill Cutoff Road (NFSR 03S08) (see Figure 3.14-1). There are no bicycle facilities on other roadways near the Project site.

Pedestrian facilities generally consist of sidewalks, crosswalks, curb ramps, pedestrian signals, and streetscape amenities. Roadways within proximity of the Project site do not include such facilities. However, there are several interconnecting multi-use paths (shared by cyclists and pedestrians) and recreational trails located throughout the Project area that provide access to scenic viewpoints, campgrounds, parklands, and other recreational facilities. These paths and trails are generally located adjacent to major roadways (e.g., U.S. Highway 395, SR 203, and Sawmill Cutoff Road (NFSR 03S08)) and intersect with multiple NFSRs.

3.16.2 Applicable Regulations, Plans, and Policies/ Management Goals

3.16.2.1 Federal

Title 36 Code of Federal Regulations (CFR) Part 212, addresses travel management regulations set forth by the National Forest Roads and Trails Act and includes standards for construction, maintenance, and operation of National Forest Roads and Trails. Title 49 CFR Subpart B, Parts 171-173, 177-178, and 350-359, address safety considerations for the transport of goods, materials, and substances and governs the transportation of hazardous materials, including types of materials and marking of the transportation vehicles.

In addition to the regulations identified in the CFR, the *Forest Service Manual* includes agency policy for management of the National Forest System. Forest Service Manual 2300, Chapter 2350, *Trail, River, and Similar Recreation Opportunities* defines the goals, objectives, and policies that pertain to the management of the Forest System as well as the roles and responsibilities to provide such services. Forest Service Manual 7700, Travel Management, defines the management of motor vehicle use on the National Forest System lands (USFS, 2009).

In order to maintain access during the winter season, "Snow Removal and Storage" Best Management Practice (BMP) (12.21 Exhibit 09, BMP 2.9), from the Soil and Water Conservation Handbook, would be apply to the CD-IV Project. The USFS has modified these BMPs to be specific to the CD-IV access roads that would be plowed for year-round access. In this location, there is no surface water or riparian areas, so erosion of the roads and adjacent undisturbed lands are the focus of these recommendations (See Appendix B, USFS, 2012).

3.16.2.2 State

Caltrans manages interregional transportation, including management and construction of the California highway system. In addition, Caltrans is responsible for permitting and regulation of the use of state roadways. Standard Encroachment Permit Form TR-0100 would be required for use of the State highway system. Roads under Caltrans jurisdiction that are likely to be used as access routes by construction workers and construction vehicles to work sites include U.S Highway 395 and SR 203.

Caltrans' construction practices require temporary traffic control planning "during any time the normal function of a roadway is suspended" (Caltrans, 2010b). Furthermore, Caltrans requires that permits be obtained for transportation of oversized loads and transportation of certain materials, and for construction-related traffic disturbance.

3.16.2.3 Local

Mono County

General Plan

The Mono County General Plan contains goals, policies, and implementation measures that could be applicable to the proposed action (Mono County, 2009). The Circulation Element of the General Plan includes strategies and principles as they aim to enhance compatibility between land use, infrastructure, and transportation modes. Applicable goals, policies, and implementation measures related to the proposed Project are discussed below.

Environmental Issues

Goal 2: Develop and enhance the transportation and circulation system in a manner that protects the County's natural and scenic resources and that maximizes opportunities for viewing those resources.

Policy 1: Develop and maintain roads and highways in a manner that protects natural and scenic resources.

Objective 1.1: Locate roads so that topography and vegetation screen them. When feasible, use existing roads for new development. Minimize cut and fill activities for roadway construction, especially in scenic areas and along hill slopes. Minimize stream crossings in new road construction.

Policy 2: Maintain State and Local scenic highway and byway designations and provide opportunities to enhance/interpret natural and scenic resources along those routes.

Operational Issues

Goal 1: Provide for an improved countywide highway and roadway system to serve long-range projected travel demand at acceptable levels of service and to improve safety.

Objective 3.1: Require new development to comply with the County Road Improvement Standards as condition of project approval. The Department of Public Works shall work with the developers to meet this objective where appropriate.

Objective 3.3: Require correction of potential safety deficiencies (e.g., inadequate road width, lack of traffic control devices, intersection alignment) as condition of project approval.

Goal 6: Maintain a balanced freight transportation system to provide for the safe and efficient movement of goods.

Policy 6.3: Strive to support federal and state efforts to levy higher user charges to adequately mitigate truck traffic impacts on roadways, consistent with the overall transportation goal.

Policy 6.4: Encourage the scheduling of freight deliveries to avoid peak traffic congestion.

In addition to the goals, policies, and objectives presented above, the General Plan also recognizes the recreational traffic issues along major roadway facilities and addresses issues related to traffic safety and the transport of goods and materials along such roadways. Specifically, the General Plan states the need for additional specialized transportation facilities throughout the County, including pedestrian and bicycle facilities and traffic safety enhancements along U.S. Highway 395. The General Plan also addresses the potential for hazardous materials spills along major truck routes, including U.S. Highway 395, and the need to implement measures to mitigate the potential adverse effects of transporting hazardous materials along the highway. Other issues identified in the General Plan include congestion levels along SR 203 and the need to reduce traffic during high tourist seasons.

The County currently maintains nearly 700 miles of roadway, which require snow removal, regular pavement maintenance, and rehabilitation. The Mono County Road Department provides such services as well as improving roadway surfaces and alignments. The General Plan recognizes that traffic volumes continue to increase along County-maintained roads, and that there is a need for mitigation of future potential impacts to the transportation network and for a standardized means of assessing such impacts.

Town of Mammoth Lakes

General Plan

Although the planned components of the proposed action would be located outside the Town Limits, construction and operational activities and associated Project-generated traffic would utilize roadways within the Town Limits. The Transportation and Circulation Element of the Town of Mammoth Lakes *General Plan Update* includes policies for providing specific direction in maintaining transportation service standards, improvements, sharing the cost for improvements, and managing travel demand for land in areas throughout the Town of Mammoth Lakes (Town of Mammoth Lakes, 2007). Specific goals, objectives, and policies specific to the proposed action include:

> **VII.1.B.c.1:** The Town shall require the preparation of a traffic impact analysis report to identify impacts and mitigation measures for projects that may potentially result in significant traffic impacts.
>
> **VII.2.B.c.6:** Scheduling of freight deliveries to avoid periods of peak traffic congestion shall be encouraged.

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3.17 Utilities and Public Services

This section describes the regulatory framework and environmental setting associated with construction and operation of the Project or its alternatives with respect to utilities and public services that may be present in the Project area.

3.17.1 Environmental Setting

3.17.1.1 Law Enforcement

Law enforcement services for the Project area are shared by the Mammoth Lakes Police Department and the Mono County Sheriff's Department. The Mammoth Lakes Police Department, located at 568 Old Mammoth Road, provides law enforcement responsibilities for the Town of Mammoth Lakes whereas the Mono County Sheriff's Department serves unincorporated portions of Mono County. The southern sections of Mono County are patrolled by Deputies that are stationed out of the Crowley Lake Sub-Station, approximately 12 miles from the Project area (MCSD, 2012).

3.17.1.2 Fire Protection

Fire protection services serving the Project area are shared by the USFS Inyo National Forest, the MLFPD, and the LVFD. The MLFPD serves approximately 24 square miles of which only 4.6 square miles is non-federal land. The non-federal land is developed with more than 7,500 residents and more than 1,500,000 square feet of commercial development. The MLFPD and the USFS work closely together to provide protection to the federal lands surrounding the Town of Mammoth Lakes. The MLFPD has two stations: Station #1 is located at the corner of Main Street and Forest Trail and is home to the department's administrative offices and the Mono County paramedics; Station #2 is located on Old Mammoth Road (MLFPD, 2011). The LVFD responsibility area covers approximately 114 square miles of Mono County, including Casa Diablo geothermal power plant facilities, and portions of U.S. Highway 395 and SR 203. The LVFD station is located at Lake Crowley, approximately 12 miles from the Project area (LVFD, 2011).

3.17.1.3 Emergency Services

Emergency medical services including paramedic and ambulance services are provided by the Mono County Paramedics and Long Valley Fire Protection District. The Mammoth Hospital, located at 85 Sierra Park Road, is a 17-bed facility (Mammoth Hospital, 2012).

3.17.1.4 Schools

The Mammoth School District provides elementary and secondary education for the local area. Schools located closest to the Project area include Mammoth Elementary School, Mammoth Middle School, Mammoth High School, and Sierra High School, each of which is located approximately 0.5 mile south of the Project area.

3.17.1.5 Water and Wastewater Supply

MCWD provides water supply and sewer services to the Town of Mammoth Lakes and provides potable water to an underground 20,000-gallon storage tank at the existing Casa Diablo Geothermal Complex. This water is used for sink, safety eyewashes, and other miscellaneous purposes. Drinking water at the existing Casa Diablo Geothermal Complex is provided under contract with a bottled water supplier. Non-potable water use for irrigation and other plant services is supplied by an on-site non-potable shallow groundwater well.

The MCWD serves a permanent population of 8,234, with peak populations of more than 30,000 during weekend and holiday periods. MCWD also provides service to customers outside of its service boundary, who are primarily USFS permittees engaged in summer recreation activities on the surrounding national forest lands. MCWD daily water demand averaged 2.0 million mgd in 2010 (MCWD, 2010).

3.17.1.6 Electrical Service

SCE provides electrical service to the Project area, although the Casa Diablo geothermal power plants provide their own power through utilization of the geothermal resource. SCE owns and operates an above-ground 33 kV electric transmission line (mounted on wooden poles, with a 12.5-kV distribution line and a fiber optic line built underneath) that runs roughly east-west and parallels “Pole Line Road” along the southern side of the Project area.

3.17.1.7 Solid Waste

The Benton Crossing Landfill is the nearest landfill to the Project area. This landfill handles non-hazardous solid waste for the landfill and source-separated waste for management through its waste diversion program. As of 2011, the remaining capacity of the Benton Crossing Landfill was approximately 1,235,297 cubic yards (Carter, 2011) and should accommodate the waste disposal requirements of the service area through the year 2023 (CalRecycle, 2011).

Hazardous materials use, including hazardous waste, is addressed in Section 3.14, *Public Health and Safety, Hazardous Materials, and Fire*.

3.17.2 Applicable Regulations, Plans, and Policies/ Management Goals

There are no federal or state regulations governing public services or utilities that pertain to the Project. Local policies are described below.

3.17.2.1 Local

Mono County

The following development standards contained in the Mono County General Plan Land Use Element (Mono County, 2007) and Safety Element (Mono County, 1993) provide for adequate protection of utilities and fire protection requirements:

Land Use Element: Chapter 8, Development Standards – Scenic Combining District & State Scenic Highway

Section 08.030 Standards – General

G. All new utilities shall be installed underground in accordance with Chapter 11, Development Standards – Utilities.

Safety Element: Section III Policies – Goal II

B. Regulate development in a manner that protects people and property from unreasonable risks of wildland and structural fire hazards.

Policy 1: Require adequate structural fire protection for new development projects.

Action 1.1: Development projects shall demonstrate the availability of adequate structural fire protection prior to or as a condition of permit issuance. Applicants shall provide either a will-serve letter from the applicable fire protection district or, if not within an existing fire district sphere of influence, a fire protection plan. The fire protection plan shall be part of the development application and shall identify the nature of the local fire hazard, assess the risk of wildland and structural fires presented by the project, and specify measures for detecting and responding to fires on the project site throughout all phases of the proposed development. Projects lacking adequate fire protection shall not be approved.

Action 1.2: Require subdivisions and residential, commercial, industrial, and resource extraction development projects, or similar high intensity proposals, to demonstrate the availability of adequate structural fire protection in accordance with Action 1.1. Project approvals shall include a finding that adequate structural fire protection is or will be available.

Policy 2: Require new construction to comply with minimum wildland fire safe standards, including those established for emergency access, signing and building numbering, private water supply reserves for fire use, and vegetation modification, as contained in the county's Fire Safe Ordinance.

Town of Mammoth Lakes

The following policies contained in the Mammoth Lakes General Plan guide the placement of utilities and provide for adequate safety and attractiveness of the Town of Mammoth Lakes (Mammoth Lakes, 2007):

C.3.F Policy: Maintain public rights-of-way for use by the public. Full or partial street closures by buildings, utilities, ramps, or other facilities may be allowed for public plazas, parks or open space.

C.3.F Policy: Underground utilities within the community.

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3.18 Visual Resources

This section describes the visual resources surrounding the Project area and the regulatory framework associated with construction, operation and decommissioning of the Proposed Action. The Proposed Action is within the Inyo National Forest which utilizes the USFS Visual Management System for ratings of visual quality, provides an established inventory and analysis of the visual and aesthetic values of the surrounding National Forest Lands.

3.18.1 Environmental Setting

This visual resources analysis considers the regional landscape and specific areas within view of the Project. The visual analysis incorporates previous USFS visual evaluations and Visual Quality Objectives for the National Forest lands as well as state and local regulatory guidance established for visual resources and geothermal development in the area.

3.18.1.1 Regional Setting

The Project area is located in the Inyo National Forest and is surrounded by peaks rising above 12,000 feet to the west and south. The rugged topography, expansive forest landscapes, and lakes in the region provide visual resources of particularly high scenic value. The visual character of the region is dramatic and is one of the primary attractions for visitors to the Mammoth Lakes and the Mammoth Mountain Ski area, which is approximately four miles west of the Project area. Located at the eastern base of the Sierra Nevada Mountains, the Project area is set in a valley at an elevation between 7,250 and 7,550 feet above mean sea level. Vegetation in the region varies, but in the Project area consists mainly of low-level sagebrush and bitterbrush, and conifer forest.

The Project area is generally known as Casa Diablo Springs, at the intersection of U.S. Highway 395 and SR 203. In comparison to the vivid Sierra Nevadas to the west of the Project area, Casa Diablo is at a lower elevation within Long Valley. This area is characterized by gently sloped hills covered with sagebrush scrub vegetation and scattered pine forests. The western portion extends into the Jeffrey Pine forest. The Project area is surrounded by natural forested area, with open sage scrub in valley floor. Forest Service roads and electric transmission lines traverse the valley floor which the USFS has designated as a Concentrated Recreation Area.

3.18.1.2 Project Viewsheds

Existing Geothermal Facilities at U.S. Highway 395 and State Route 203

The Project area is shown in Figure 3.18-1. To the east are the three existing geothermal power plants of Casa Diablo (referred to as MP-I, MP-II, and PLES-I). These facilities are in low-lying sagebrush surrounded by pine forests. Electric transmission lines are visible in the middleground, with rolling forested hills in the background. The proposed power plant site is just north of an existing SCE electric substation, approximately 0.25 mile north of the MP I power plant and approximately 0.4 mile northwest of MP-II and PLES-I power plants, approximately 0.5 mile northeast of the U.S. Highway 395 and SR 203 intersection, and currently occupies vacant land vegetated with pine trees. The elevated topography and the presence of tall pine trees obstruct eastern facing views of the existing substation and proposed power plant site. Old Highway 395, located east of and parallel to U.S. Highway 395, is a narrow two-lane road that provides access to the eastern portion of the Project area including MP-I, MP-II, and PLES-I power plant facilities, and the SCE substation. Use of this road is predominantly by power plant and substation operators. Drivers along this roadway have immediate views of these facilities as well as scattered pine trees and shrub vegetation.

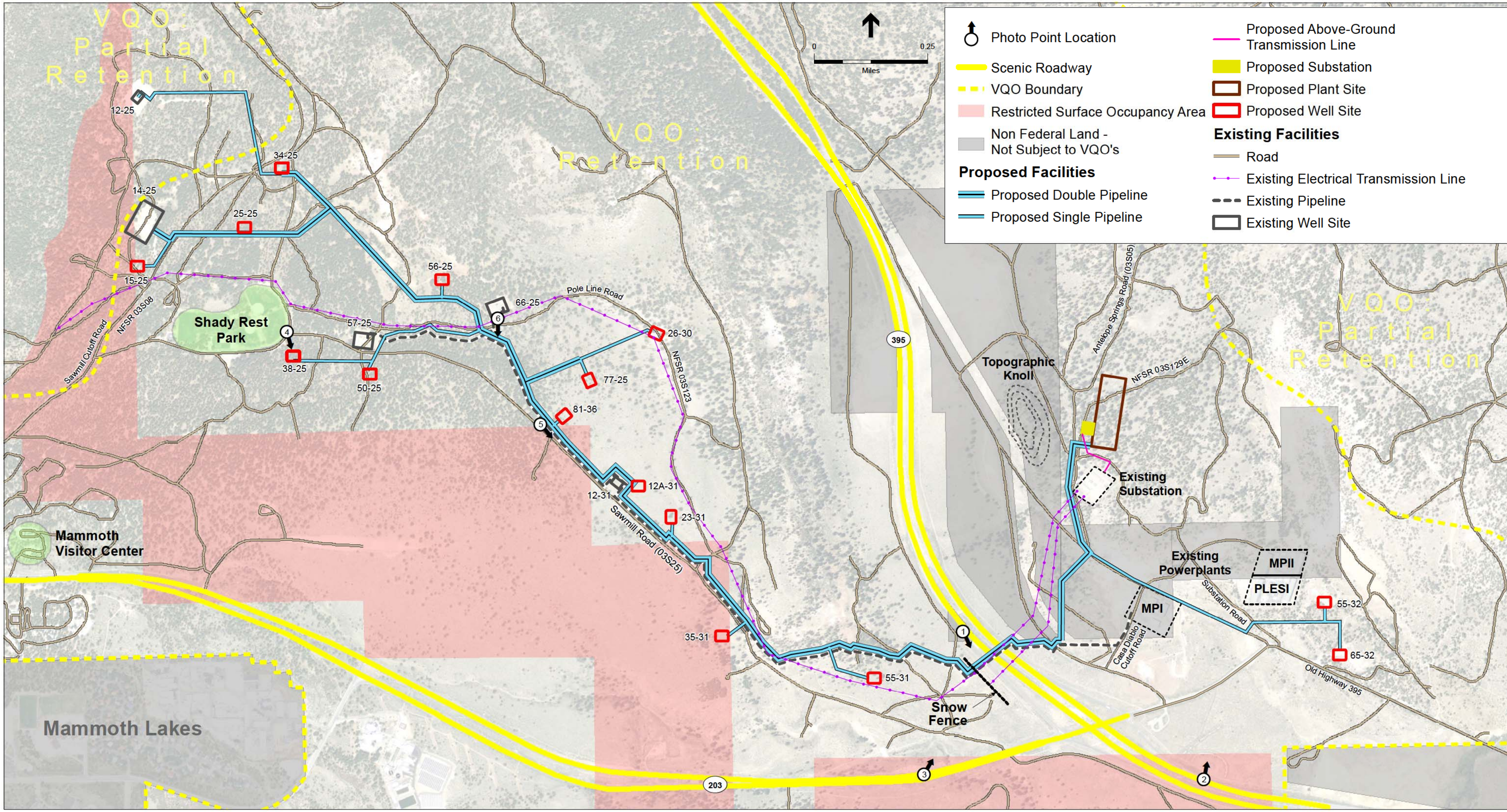
To the west of Highway 395 is an SCE electric transmission line which generally parallels Sawmill Road (03S25) and crosses U.S. Highway 395 just north of its intersection with SR 203, and is visible from U.S. Highway 395. Also paralleling Sawmill Road are existing above ground geothermal pipelines which are generally out of view except when crossing U.S. Highway 395. A wood snow fence partially screens a portion of the existing geothermal pipeline near U.S. Highway 395 and the pipelines are green to help blend them in with surrounding vegetation.

U.S. Highway 395

U.S. Highway 395 is a State Designated Scenic Highway that bisects the site and provides primary access up and down the eastern side of the Sierra Nevada providing mountain views to the west and glimpses of the Great Basin to the east. SR 203 intersects U.S. Highway 395 at the Project site and provides access to the Town of Mammoth Lakes. From the intersection eastern facing views of the Casa Diablo area consist of low-lying shrubs including sagebrush and bitterbrush in the foreground, the geothermal power plants (discussed above), and gently rolling forested hills in the background.

To the west of U.S. Highway 395, and as shown in Photo 1 in Figure 3.18-2, drivers travelling southbound along U.S. Highway 395 have vast views of the rugged Sierra Nevada dominating backgrounds of views with low-lying vegetation, and hills covered with pine trees in the middleground. Southbound drivers on U.S. Highway 395 have close-up views of the Casa Diablo area, when crossing the SR 203 underpass. Drivers travelling north along U.S. Highway 395 have views of the Sierra Nevada to the west and Long Valley in the eastern foreground. As shown in Photo 2 in Figure 3.18-2, rolling hills and trees generally block views of the existing geothermal power plant facilities to the east of the highway. Green exteriors of the power plant facilities help blend them in with the surrounding landscape. Views of the existing power plant facilities are relatively close to the intersection of U.S. Highway 395 and SR 203.

Natural thermal ground areas (referred to as fumeroles, hot or steaming ground, etc.) emit steam plumes of various heights in the Project vicinity. These plumes are visible from U.S. Highway 395 but become more prominent under cold weather conditions. Due to distance, speed of travel, and intervening vegetation, views of the existing Casa Diablo Geothermal Complex are relatively indistinct. Given the predominantly natural landscapes visible to drivers and because U.S. Highway 395 is considered a State Designated Scenic Highway, the viewer sensitivity is high.



SOURCE: Ormat, 2011; NAIP, 2010; USFS, 2011; USGS, 2011

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.18-1
Photo Viewpoint Map

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Photo 1: South-facing view of Project area from U.S. Highway 395 just before the SR 203 junction (KOP #1)

Photo 2: North-facing view of Project area from U.S. Highway 395 just south of the SR 203 junction

SOURCE: ESA

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.18-2
Representative Photos from Public Viewing Locations in the Project Area (Photos 1 and 2)

State Route 203

SR 203 is a county designated scenic route and provides access to Mammoth Lakes from U.S. Highway 395. From SR 203, visible portions of the Project area are generally in the middground distance except at highway crossings. Views from SR 203 predominantly consist of open meadows and natural forested lands interspersed with electric transmission lines, also in the middleground.

As shown in Photo 3 in Figure 3.18-3, eastbound and westbound drivers travelling along SR 203 have views of low-lying shrubs in the foreground, electric transmission lines and a snow fence in the middleground, and tree-covered hills in the background. Existing aboveground geothermal pipelines and wells are visible in the distance, though camouflaged behind snow fences to address USFS Visual Quality Objectives in this area (see subsequent section under Federal Regulations). SR 203 is a county-designated scenic route, and the Project site that is within view of SR 203 is also within a USFS 'Concentrated Recreation Area' and the viewer sensitivity is high.

Shady Rest Park

From Shady Rest Park, located at the end of Sawmill Cutoff Road (NFSR 03S08), recreationists have views of the western portion of the Project area including proposed well site 38-25. As shown in Photo 4, Figure 3.18-3, views of this particular area from the eastern portion of the Shady Rest parking lot predominantly consist of tall pine trees. Facilities near NFSRs in this area would be visible to recreationists and may not be consistent with the USFS Visual Management System. Therefore, due to the well site's high level of visibility from Shady Rest Park, the viewer sensitivity is also high.

National Forest System Roads

As described in Section 3.14, Recreation, numerous trails and NFSRs traverse throughout the Project area. These trails and roads are widely used for winter recreation activities such as Nordic skiing, snowmobiling, and snowshoeing. During the summertime, these trails are used for dog walking, jogging, and mountain biking. Views from these roads and trails generally consist of pine trees and low-lying shrubs in the foreground and middleground, some of which include distant views of the Sierra Nevadas.

The northwestern portion of the Project area encompasses various NFSRs, Sawmill Cutoff Road (NFSR 03S08), and scenic lands within foreground and middleground distance ranges. Recreationists using these roads have views of tall pine trees and scattered shrub vegetation, when not covered with snow. A large portion of the Project area occurs along Sawmill Road (03S25). Existing wells 57-25, 66-25, and 12-31 and associated geothermal pipelines are currently adjacent to Sawmill Road (03S25) and visible to recreationists that use this road. Photos 5 and 6 in Figure 3.18-4 show representative views of the existing geothermal pipeline that is adjacent to Sawmill Road (03S25). As shown in Photo 6, the geothermal pipeline is belowground at road crossings.

Photo 3: Northeast facing view of Project area from SR 203 (KOP #2)

Photo 4: Southeast facing view of proposed well site 38-25 from Shady Rest Park parking lot (KOP #3)

SOURCE: ESA

Figure 3.18-3
Representative Photos from Public Viewing Locations in the Project Area (Photos 3 and 4)


Photo 5: Southeast facing view of an existing geothermal pipeline and Project area from Sawmill Road (03S25)


Photo 6: South-facing view of an existing geothermal pipeline crossing Sawmill Road (south of existing well 66-25)

SOURCE: ESA

Casa Diablo IV Geothermal Development Project . 209487

Figure 3.18-4
Representative Photos from Public Viewing Locations in the Project Area (Photos 5 and 6)

3.18.1.3 Summary of Visual Sensitivity

Visual sensitivity is a measure of interest or concern that responsible land management agencies have for particular visual resources. Designated scenic resources, such as State Designated Highways or parklands indicate heightened sensitivity to the existing visual quality of landscape setting. The USFS has also systematically identified Visual Quality Objectives (VQOs) for this area, further described in the following regulatory section. To summarize, the USFS recognizes the scenic qualities of this area and requires either complete or partial retention of those qualities.

Photos presented in this chapter show multiple views of the Project area from designated scenic resources including scenic highway corridors and adjacent parklands. Specific photos listed in Table 3.18-1, Summary of Visual Quality and Sensitivity from Key Observation Points (KOPs), were selected to evaluate the visual sensitivity of the area to the proposed geothermal pipeline alignments and facilities. These KOP photos were selected because they are the closest publically available viewpoints on SR 203, U.S. Highway 395, and Shady Rest Park of the CD-IV Project.

TABLE 3.18-1
SUMMARY OF VISUAL QUALITY AND SENSITIVITY

KOP # (Photo#)	Viewpoint Location[a]	Type of View	Viewing Direction	Distance to Project	Visual Quality	Visual Sensitivity
KOP 1 (Photo 1)	U.S. Highway 395	State Designated Highway	SW	500 feet near	High	High
KOP 2 (Photo 3)	SR 203	County scenic route	NE	0.25 Mile moderate	High	High
KOP 3 (Photo 4)	Shady Rest Park	Recreational trailhead and parking area	SE	20-40 feet very close	High	High

NOTES:
[a] See Figure 3.18-1 for viewpoint locations.

Project related factors such as the distance facilities are placed from public view, the size, the contrast and clarity of views to the proposed changes, and the duration that a particular view would be visible, also affect visibility. Still, the area maintains consistently high visual quality, and has designated visual resources for which visual sensitivity is consistently high.

KOP 1 (Photo 1, Figure 3.18-2) is looking from the southbound lane of U.S. Highway 395 just before the Mammoth Lakes exit, and shows where the pipeline would cross U.S. Highway 395. This photo captures many of the scenic qualities of the area, including the Sierra Nevada and foothills, a stand of pine trees, and open meadows providing for open views to the mountains. Man-made structures include the roadway and sign, an electrical transmission line, and an existing geothermal pipeline (camouflaged to be less visible). This scenic highway is commonly travelled, with nearly 1,200 vehicles an hour (Caltrans, 2010). The open views of the mountains are of particularly high visual quality, and the scenic designations of both highways at this intersection combine to create high visual sensitivity at this location.

KOP 2 (Photo 3, Figure 3.18-3) is looking northeast from SR 203 toward the area where the proposed pipeline would be visible. This photo is indicative of what views would look like with the proposed Project, showing the existing electrical transmission line and an existing aboveground geothermal pipeline as they traverse across the valley floor approximately 0.25 mile away. This view the Project area is visible from SR 203 for approximately 2 miles, making it a relatively long duration view.

KOP 3 (Photo 4, Figure 3.18-3) is from the eastern end of the Shady Rest Park parking lot, showing the proposed well site 38-25. The well at this location would be visible to park visitors and recreationists using Sawmill Road (03S25). The USFS has designated this as a Concentrated Recreation Area (USFS, 1988) to provide regional recreation opportunities. As parks and trails are typically maintained for high visual quality and this particular Project site is directly visible from within the park the visual sensitivity of this view is high.

3.18.2 Applicable Regulations, Plans, and Policies/ Management Goals

3.18.2.1 Federal

USFS Visual Management System

The Proposed Action is within the Inyo National Forest; and all land within USFS jurisdiction is subject to the Visual Management System. The Forest and Rangeland Renewable Resources Act of 1974 established a legal requirement for scenery management on National Forest System land. Other lands, including private lands however are not subject to the scenery management requirements. The Visual Management System guidelines are established in the *National Forest Landscape Management, Volume 2, Chapter 1: Visual Management System, USDA Forest Service, Agriculture Handbook Number 462* (1974). As defined in the Visual Management System, the USFS established VQOs for these national forest lands. The four VQOs are; “Preservation,” the most restrictive designation, followed by “Retention,” “Partial Retention,” and “Modification,” the least restrictive. These VQOs are defined in terms of Distance Zones (foreground, middleground, and background), Sensitivity Levels (1, 2, or 3) and Variety Class (A, B, and C) (USFS, 1974). Definitions for these terms are briefly described below.

Visual Quality Objectives (VQOs)

The VQOs relevant to the Proposed Action area are “Retention” (R) and “Partial Retention” (PR). The “Retention” designation provides for those management activities that are not visually evident, allowing those activities that would repeat form, line, color and texture of the surrounding characteristic landscape. This designation limits visual changes that would alter the characteristic landscape and the LRMP requires additional approvals from the Forest Supervisor when there are deviations from the established VQO prescriptions. Existing geothermal facilities within the “Retention” areas were approved in this manner. The “Partial Retention” designation also requires that management activities be subordinate to the characteristic landscape, but allows the introduction of forms, lines, colors and textures found infrequently in the characteristic landscape as long as those elements, (pipelines, electrical transmission lines, and other aboveground structures), remain subordinate to the visual strength of the characteristic landscape.

Distance zones are the divisions of a landscape as it is viewed from a particular point and are used to describe the near and distant portions part of the characteristic landscape being evaluated. There are three distance zones: the foreground, middleground and background. The foreground is typically limited to areas within ¼ mile of the observer. The middleground in such a setting would extend from the foreground to 3 to 5 miles from the observer. The background extends from the middleground to infinity.

Sensitivity levels are a measure of public concern for scenic values, where the public includes: those traveling on developed roads and trails; those using campgrounds or visitor centers; and those recreating at lakes, streams, and other water bodies. Level 1 has the highest sensitivity, level 2 has average sensitivity, and level 3 has the lowest sensitivity referring to lands visible only from secondary use areas.

Variety classes classify landscapes into different degrees of variety to determine the comparative importance of landscapes. Generally, the highest values are assigned to landscapes with the most variety and diversity. Class A are distinctive landscapes, Class B are common or characteristic of the region without outstanding visual quality, and Class C are areas where features exhibit little variety in form, line, color or texture.

VQOs in the Project Area

As shown in Figure 3.18-1, the majority of the Project area within USFS jurisdiction, has been designated “Retention,” VQO, with a small area to the far west designated “Partial Retention” VQO.

Inyo National Forest Land and Resource Management Plan

The LRMP, completed in 1988, provides direction for management activities on the Inyo National Forest including standards and guidelines for the protection of visual resources. The following standards and guidelines contained in Chapter 4 of the plan apply to the Proposed Action:

1. Obtain the Forest Supervisor’s approval through the environmental analysis process for any deviations from VQOs assigned in Prescriptions.

2. Maintain foregrounds and middlegrounds of the scenic corridors of the following travel routes to Retention and/or Partial Retention VQOs as inventoried, but not less than Partial Retention:

    a. Highways officially designated as State of California and County Scenic Highways in the September 1970 Master Plan, including U.S. Highway 395 and SR 203.

    b. Meet the Retention VQO in all foreground zones of other Sensitivity Level 1 roads and trails, recreation sites, and within all concentrated recreation areas.

BLM Geothermal Leases CACA-14407 and CACA-14408 Stipulations

As shown in Figure 3.18-1, portions of Geothermal Leases CACA-14407 and CACA-14408 are covered by the special stipulation which states that "No surface disturbing activities will be permitted in the No Surface Occupancy areas shown on Map 5, attached, unless the lessee can demonstrate through an appropriate plan of operation or permit application that no unacceptable environmental impacts will occur from the proposed operations." These restrictions were adopted in part to protect scenic resources along U.S. Highway 395, State Route 203, and Sawmill Cutoff Road (NFSR 03S08) on these two lease areas.

3.18.2.2 State

In 1963, the state legislature established the California Scenic Highway Program, a provision of the Streets and Highways Code, to preserve and enhance the natural beauty of California (Caltrans, 2012). The State Highway System includes highways that are either eligible for designation as scenic highways or have been designated as such. The section of U.S. Highway 395 from its junction with SR 120 south to the Inyo County line is a California State Designated Scenic Highway.

3.18.2.3 Local

Mono County

The stretch of SR 203 south of the Project area (from its intersection with U.S. Highway 395 west to its junction with Sierra Park Road) is a Mono County-designated scenic highway. The following development standards within the Mono County's Scenic Combining District are intended to regulate development activity in scenic areas. Applicable standards include:

A. Visually offensive land uses shall be adequately screened through the use of extensive site landscaping, fencing, and/or contour grading.

B. Earthwork, grading and vegetative removals shall be minimized.

C. All site disturbances shall be revegetated with plants and landscaping which are in harmony with the surrounding environment…

D. The design, color and materials for buildings, fences and accessory structures shall be compatible with the natural setting.

The Mono County General Plan's Conservation/Open Space Element (1993) contains several policies and objectives, policies, and actions relevant to visual resources. The following specific actions and objectives pertain to geothermal exploration and development:

1. All geothermal pipelines potentially visible in scenic highway corridors or important visual areas shall be obscured from view by fences, natural terrain, vegetation, or constructed berms, or they shall be placed in stabilized or lined trenches (Goal I, Objective D, Action 1.18).

2. Geothermal exploration and development projects shall be carried out with the fewest visual intrusions reasonably possible (Goal I, Objective F).

The following objectives contained in the Conservation/Open Space Element also provide for protection of visual resources:

1. Maintain and enhance visual resources in the County (Objective A).
2. Maintain a countywide system of state and county designated scenic highways (Objective B).
3. Ensure that development is visually compatible with the surrounding community, adjacent cultural resources, and/or natural resources (Objective C) (Mono County, 1993).

In addition, the segment of U.S. Highway 395 that runs past the Project site is part of the Route 395—Mono County Scenic Byway and the Eastern Sierra Scenic Byway (National Byways, 2012 and Eastern Sierra Scenic Byway, 2012). Mono County is currently developing the Highway 395 Corridor Management Plan, which aims to provide preservation and interpretation of the scenic resources along the route for visitors (Mono County, 2012).

Town of Mammoth Lakes

The Town of Mammoth Lakes General Plan (2007) contains the following policies related to light and glare:

> ***C.5 Goal*****:** Eliminate glare to improve public safety. Minimize light pollution to preserve views of stars and the night sky.
>
> > *C.5.A Policy*: Require outdoor light fixtures to be shielded and down-directed so as to minimize glare and light trespass.

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3.19 Water Resources

This section presents the existing hydrologic setting of the Project area and vicinity including available information with respect to existing waterways, drainages, groundwater, floodplain extent, and water quality. Applicable laws, policies, and other regulatory requirements are presented, as relevant. For a discussion of riparian and wetland vegetation within the Project area, please refer to Chapter 3.3, Biological Resources – Vegetation.

3.19.1 Environmental Setting

3.19.1.1 Surface Water Hydrology and Water Quality

Surface Waters and Drainages

Drainage within the Project area is provided by Hot Creek and its tributaries, which are located within the Casa Diablo Hot Springs and the Mammoth Lakes Planning Watersheds, located in the Mammoth Creek Super-Planning Watershed of the Long Hydrologic Sub-Area, within the Owens hydrologic unit, as mapped by the California Department of Conservation (2012). Hot Creek is located southeast of the Project area, flowing generally from west to east (Figure 3.19-1). Nearby tributaries include Mammoth Creek, which merges with Hot Creek about 0.3 mile southwest of the Project area. Downstream, Hot Creek meanders east and north, before merging with the Owens River in Long Valley. The Owens River originates about 10 miles northwest of the Project area. After its convergence with Hot Creek, it continues to flow south into Lake Crowley, located about 15 miles downstream of the Project area. Lake Crowley is a reservoir that was installed by the LADWP and provides water to the Los Angeles Aqueduct, and discharges into the Owens River. Below Lake Crowley, the Owens River flows generally south and east along the Owens Valley. Most of the flow in the river is eventually routed into the Los Angeles Aqueduct south of Big Pine, while about 5 percent of flows continue to Owens Lake.

Drainage within the eastern portion of the Project area is provided by an intermittent drainage that runs from about 0.3 mile east of U.S. Highway 395 in a southeasterly direction, merging with Hot Creek about 0.8 mile downstream. Other portions of the Project area drain into internal basins. Several of these were previously mapped by the USGS as blue line streams. However, recent groundtruthing surveys (Paulus, 2012) revealed that many of these areas show no defined banks or other structures indicative of active waterways (Figure 3.19-1). Additionally, ephemeral swales located along the western portion of the Project area, generally located west of U.S. Highway 395, drain internally and are not hydrologically connected to Hot Creek or other downstream waterways.

Flows within Hot Creek and Mammoth Creek are perennial, although they are typically swelled to peak by spring snowmelt, with reduced flows during summer and later summer months. Murphy Gulch is a larger, intermittent tributary that drains from west to east alongside the northern side of SR 203. Two small dams, each with an associated siltation basin, are located less than 0.25 mile south of proposed Well 55-31. These features collect and store sediment from storm water and snow melt runoff from the Town of Mammoth Lakes. Approximately 0.2 mile downstream from the second siltation basin, Murphy Gulch flows under SR 203 and into Mammoth Creek (EMA, 2005).

The USGS maintains six Mammoth Creek/Hot Creek gauging and/or water quality sampling stations in the vicinity of the Project area:

1. Western edge of the Town of Mammoth Lakes (Mammoth Creek Above)
2. Mammoth Creek Park (Mammoth Creek Sherwin Rd) in the Town of mammoth lakes
3. Mammoth Creek Park (Mammoth Creek Flume, which is within 100 meters the previous station) in the Town of Mammoth Lakes
4. Mammoth Creek – U.S. Highway 395 crossing upgradient of Hot Creek
5. Hot Creek approximately 100 m downstream
6. Hot Creek approximately 600 m downstream

Periodic monitoring results for Mammoth Creek located west (i.e., upstream) of the Project area indicate variable discharge rates within the creek, ranging from 17 to 34.8 cubic feet per second (cfs). For Hot Creek to the east of U.S. Highway 395, monitoring established a baseline discharge level of approximately 40 cfs for the Hot Creek drainage between 1996 and 2010 (Farrar et al., 2010). Increased discharge above background conditions occurred in 1996 (280 cfs), 2006 (190 cfs), and 2007 (240 cfs) during periods of high precipitation and runoff (Wildermuth, 2009; Farrar et al., 2010).

Surface Water Quality

Rainfall and snowmelt-derived runoff from the region feeds surface waters having relatively low concentrations of minerals and dissolved salts, with streams fed by melting snow and stormwater runoff can have total dissolved solids (TDS) concentrations as low as 20 milligrams per Liter (mg/L). Water quality within areas affected by discharge from hot springs, including Hot Creek, can be expected to show higher TDS concentrations. Water quality is also affected by urban runoff from the Town of Mammoth Lakes, wherein according to the LRWQCB, runoff from paved surfaces has resulted in increased concentrations of nutrients, organic compounds, oils and greases, and heavy metals within Mammoth Creek and downstream areas.

Mammoth Creek is also affected by elevated dissolved solids and mercury from natural or unknown sources. The affected area of the waterway includes the area located in the vicinity of the Project area, until the creek merges with Hot Creek. Similarly, Crowley Lake downstream of the Project area is affected by elevated levels of ammonia and depleted dissolved oxygen levels, of unknown source. These waterways are included on the State Water Resources 2010 Clean Water Act Section 303(d) List of Impaired Water Bodies (discussed under the Regulatory subsection below), as shown in Table 3.19-1.

The western (upstream) reaches of Mammoth Creek are monitored at a series of monitoring stations located upstream of the Project Area. Monitoring results in these areas document low water temperatures (6.5 – 11.5^{o}C) and relatively good water quality typical of streams within the region. Downstream of these areas, samples collected periodically between 1983 and 2008 at the Mammoth Creek/U.S. Highway 395 monitoring point indicated relatively good water quality, with levels of silica at 20.9 mg/L, boron at 14 micrograms per Liter (μg/L), and arsenic at 4 μg/L

TABLE 3.19-1
CLEAN WATER ACT 303(D) WATER QUALITY IMPAIRED SEGMENTS IN THE VICINITY OF THE ACTION AREA

Waterway	Water Quality Constituent	Source	Anticipated TMDL* Completion Date
Mammoth Creek	Manganese	Natural Sources	2021
Mammoth Creek	Mercury	Natural Sources	2019
Mammoth Creek	Total Dissolved Solids	Source Unknown	2021
Crowley Lake	Ammonia	Source Unknown	2019
Crowley Lake	Dissolved Oxygen	Source Unknown	2019

* Total Maximum Daily Load (TMDL); SOURCE: SWRCB, 2011.

(USGS, National Water Information System (NWIS)). Downstream of the confluence with Hot Creek, temperatures and water quality are distinctly different from upstream areas. Temperatures have been observed as high as 61°C downstream of Casa Diablo near where Mammoth Creek joins Hot Creek, collected from 1982 to 1986. Analytical results from the site also show elevated levels of sulfate (115 mg/L), silica (188 mg/L), chloride of 193 mg/L and total dissolved solids (866 mg/L) (USGS, 2012).

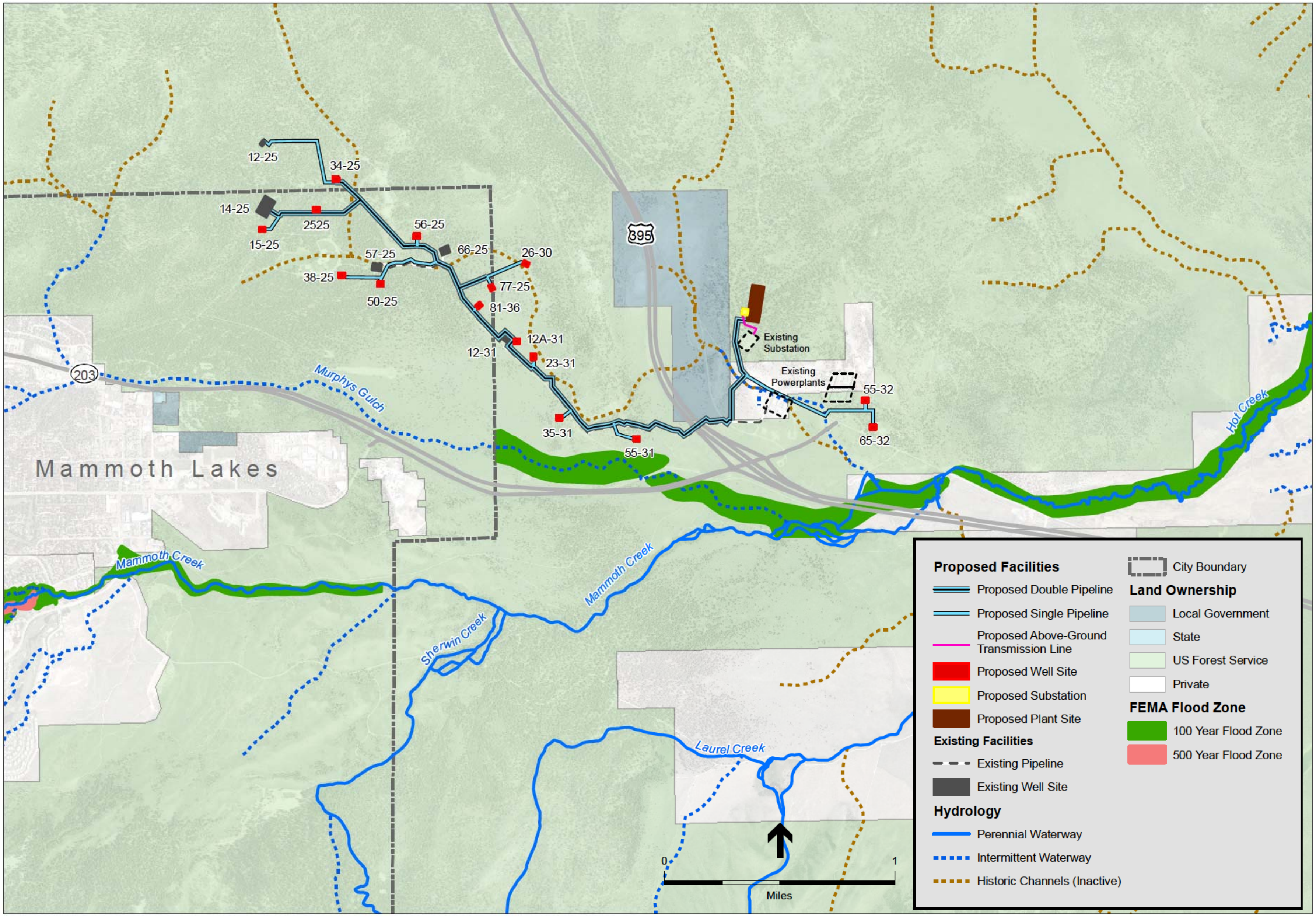
Flooding

The Federal Emergency Management Agency (FEMA) provides information on flood hazard and frequency for cities and counties on its Flood Insurance Rate Maps (FIRMs). FEMA identifies designated zones to indicate flood hazard potential. Within the Action Area and its vicinity, FEMA has designated lands that are anticipated to be subject to potential flooding during 100-year and 500-year flood events, where a 100-year flood is defined as an event having a 1 percent chance of occurring each year, and a 500-year flood is defined as an event having a 0.2 percent chance of occurring each year. FEMA flood zones for the Action Area and vicinity are shown on Figure 3.19-1. The proposed facilities, including all pipelines, wells, and the proposed power generation facilities, are located entirely outside of all 100-year flood zones. As shown in Figure 3.19-1, the closest flood zone to the proposed facilities is associated with Hot Creek, and is located at least 300 feet south of the nearest proposed facilities. A portion of the Project area, located north of the Town of Mammoth Lakes, has not been mapped by FEMA. However, these areas are located topographically at least 50 feet higher than identified flood zones, and are not located along waterways or other water features that are anticipated to be subject to flooding.

3.19.1.2 Groundwater

Groundwater Basin and Levels

The Project area is located along the southeastern boundary of the Long Valley Groundwater Basin, as defined by the California Department of Water Resources (DWR) (2004). The Long Valley Groundwater Basin is bounded by Bald and Glass Mountains to the north, by Round Mountain on the east, by mountains separating Long Valley and Owens Valley to the south, and



SOURCE: FEMA, 2010; NHD, 2011; Ormat, 2011

Casa Diablo IV Geothermal Development Project . **209487**

Figure 3.19-1

FEMA Flood Zones and Surface Hydrology

by volcanic highlands to the west. Surface waters in the groundwater basin include those discussed previously, with the primary water features of the basin being the Owens River and Lake Crowley. Average annual precipitation in the groundwater basin ranges from approximately 10 to 20 inches.

Holocene and Pleistocene alluvial and lake sediment deposits form the primary water bearing units within the groundwater basin (DWR, 2004). Groundwater in the Holocene alluvial deposits is generally unconfined, while groundwater in the deeper Pleistocene formations is locally confined in the northern and western portions of the basin. The basin is also traversed by several faults; however, the effect of these faults on groundwater flow remains largely unknown.

Recharge to the groundwater basin results primarily from a combination of percolation of streamflow, combined with infiltration of precipitation incident on the valley floor. The groundwater basin has not been extensively characterized, but is expected to flow generally towards Lake Crowley in the southern portion of the basin, including the vicinity of the Action Area. Total storage for the groundwater basin has been estimated to range from approximately 180,000 to 300,000 acre-feet (DWR, 2004). Well yields range up to about 250 gallons per minute (gpm), with an average production rate of about 90 gpm (DWR, 2004).

The DWR and the USGS maintain a number of groundwater level monitoring wells in southwestern portion of the groundwater basin, including in the vicinity of the Project area. Groundwater levels in these wells are highly variable from well to well, and are largely influenced by localized topography. Generally, groundwater levels in the Project area and its vicinity range from about 7,150 feet above mean sea level (msl) near the eastern end of the Project area to about 7,400 feet near the western end (DWR, 2012). These levels are equivalent to a groundwater depth of less than 10 to over 400 feet in depth below ground surface (DWR, 2012). There are many cold springs and hot springs located within the groundwater basin. Additional discussion of groundwater, including thermal groundwater, is contained in Section 3.7, Geothermal and Groundwater Resources.

The Mammoth Community Water District (MCWD) uses groundwater to supplement surface water for municipal supply. The MCWD draws groundwater from nine production wells located within its service area. Typical pumping rates vary on a year to year basis, depending upon the availability of surface water in a given year. As shown in Table 3.19-2, groundwater pumping during 2006 through 2010 ranged from 1,066 to 2,425 acre-feet per year, ranging from 33 percent to 69 percent of total groundwater supply (MCWD, 2011). The MCWD maintains an extensive groundwater and surface water monitoring system in order to manage and monitor the basin's water resources, including 14 monitoring wells within MCWD's service boundary and along Mammoth Creek and its tributaries.

**TABLE 3.19-2
MCWD GROUNDWATER PUMPING 2006-2010**

Year	Total Groundwater Pumped (AF/yr)	Groundwater as a Percent of Total Water Supply
2006	1,066	33
2007	2,425	69
2008	2,261	67
2009	1,562	54
2010	1,098	42

SOURCE: MCWD, 2011.

Groundwater Quality

Groundwater quality within the basin is somewhat variable and is subject to localized conditions. Most groundwater is characterized as calcium bicarbonate or sodium bicarbonate, with TDS concentrations of less than 300 mg/L.[1] DWR (2004) reports that groundwater quality from 20 public supply wells had an average TDS concentration of 345 mg/L, with an approximate range of 250 to 500 mg/L. Groundwater within the basin is generally of sufficient quality to support human consumption, agricultural, and various other beneficial uses. Thermally influenced groundwater may be found in the vicinity of the Project area. These typically have a chloride character, with relatively lower calcium and magnesium concentrations and comparatively high TDS concentrations ranging from about 1,000 to 1,500 mg/L. Thermally influenced groundwater, having relatively high TDS concentrations, is common along Hot Creek. This water is typically considered to be of insufficient quality to support human consumption, livestock, or agriculture. Relatively high concentrations of boron and fluoride have also been identified in the vicinity of Hot Creek (DWR, 2004).

3.19.2 Applicable Regulations, Plans, and Polices/ Management Goals

3.19.2.1 Federal

Clean Water Act

The Clean Water Act established the basic structure for regulating discharges of pollutants into "waters of the United States." The act specifies a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff.

1. Sections 303 and 304, which provide for water quality standards, criteria, and guidelines.

[1] The ionic composition of groundwater is frequently used to classify groundwater quality with respect to dominant ions. The dominant dissolved phase cation (here calcium or sodium) and anion (here bicarbonate) are used to classify groundwater composition.

2. Section 401 requires every applicant for a federal permit or license for any activity that may result in a discharge to a water body to obtain a water quality certification that the proposed activity will comply with applicable water quality standards.

3. Section 402 regulates point- and nonpoint-source discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program. In California, the SWRCB oversees the NPDES program, which is administered by the RWQCBs. The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits. Anti-backsliding requirements provided for under Clean Water Act Sections 402(o)(2) and 303(d)(4) prohibit slackening of discharge requirements and regulations under revised NPDES permits. With isolated/limited exceptions, these regulations require effluent limitations in a reissued permit to be at least as stringent as those contained in the previous permit.

4. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including some wetlands. Activities in waters of the U.S. that are regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry.

Clean Water Act Section 303(d) Impaired Waters List

Under Section 303(d) of the Clean Water Act, states are required to develop lists of water bodies that would not attain water quality objectives after implementation of required levels of treatment by point-source dischargers (municipalities and industries). Section 303(d) requires that the state develop a total maximum daily load (TMDL) for each of the listed pollutants. The TMDL is the amount of loading that the water body can receive and still be in compliance with water quality objectives. The TMDL can also act as a plan to reduce loading of a specific pollutant from various sources to achieve compliance with water quality objectives. The TMDL prepared by the state must include an allocation of allowable loadings to point and nonpoint sources, with consideration of background loadings and a margin of safety. The TMDL must also include an analysis that shows the linkage between loading reductions and the attainment of water quality objectives. USEPA must either approve a TMDL prepared by the state or, if it disapproves the state’s TMDL, issue its own. NPDES permit limits for listed pollutants must be consistent with the waste load allocation prescribed in the TMDL. After implementation of the TMDL, it is anticipated that the problems that led to placement of a given pollutant on the Section 303(d) list would be remediated. In California, preparation and management of the Section 303(d) list is administered by the RWQCBs.

Executive Order 11988 and the Federal Emergency Management Agency

Under Executive Order 11988, the FEMA is responsible for management of floodplain areas. FEMA administers the National Flood Insurance Program (NFIP) to provide subsidized flood insurance to communities that comply with FEMA regulations limiting development in floodplains. FEMA also issues Flood Insurance Rate Maps (FIRMs) that identify which land areas are subject to flooding. These maps provide flood information and identify flood hazard zones in the community. The design standard for flood protection is established by FEMA, with the minimum level of flood protection for new development determined to be the 1-in-100 annual exceedance probability (AEP) (i.e., the 100-year flood event). Specifically, where levees provide flood protection, FEMA requires that the levee crown have 3 feet of freeboard above the 1-in-100-AEP water surface elevation, except in the vicinity of a structure such as a bridge, where the levee crown must have 4 feet of freeboard for a distance of 100 feet upstream and downstream of the structure.

Rivers and Harbors Act

The US Army Corps of Engineers (USACE) regulates the construction of any structure or work within navigable waters under Sections 9 and 10 of the Rivers and Harbors Act. The USACE regulates the construction of wharves, breakwaters, and jetties; bank protection and stabilization projects; permanent mooring structures, vessels, and marinas; intake and outfall pipes; canals; boat ramps; aids to navigation; and other modifications affecting the course, location, condition, and capacity of navigable waters. The USACE jurisdiction under the Rivers and Harbors Act is limited to “navigable waters,” or waters subject to the ebb and flow of the tide shoreward to the mean high water mark that may be used for interstate or foreign commerce. The USACE must consider the following criteria when evaluating projects within navigable waters: (1) the public and private need for the project; (2) reasonable alternative locations and methods; and (3) the beneficial and detrimental effects on the public and private uses to which the area is suited.

Safe Drinking Water Act

Under the Safe Drinking Water Act (SDWA) (Public Law 93-523), passed in 1974, the USEPA regulates contaminants of concern to domestic water supply. Contaminants of concern relevant to domestic water supply are defined as those that pose a public health threat or that alter the aesthetic acceptability of the water. These types of contaminants are regulated by USEPA primary and secondary Maximum Contaminant Levels (MCLs) that are applicable to treated water supplies delivered to the distribution system. MCLs and the process for setting these standards are reviewed triennially. Amendments to the SDWA enacted in 1986 established an accelerated schedule for setting MCLs for drinking water. USEPA has delegated to the California Department of Health Services (DHS) the responsibility for administering California’s drinking-water program. DHS is accountable to EPA for program implementation and for adopting standards and regulations that are at least as stringent as those developed by USEPA. The applicable state primary and secondary MCLs are set forth in Title 22, Division 4, Chapter 15, Article 4 of the California Code of Regulations.

U.S. Forest Service Standards and Guidelines

The USFS maintains standards and guidelines with respect to water quality and water quality management within its service area. As relevant to the Project area and its vicinity, these requirements are included in the Inyo National Forest Management Plan (USFS, 1988), the Sierra Nevada Forest Plan Amendment (USFS, 2004), and the 2012 Region 5 Water Quality Management Handbook (R5 FSH 2509.22 – Soil and Water Conservation Handbook, Chapter 10, Water Quality Management Handbook. These resources contain standards and guidelines for water quality and hydrologic process protection. Collectively, these standards and guidelines provide a series of requirements and implementation practices, including best management practices (BMPs) that are intended to minimize detrimental effects to water quality on Forest Service lands. Specific BMPs and other management actions relevant to the CD-4 Project are discussed in the impact analysis for hydrologic resources, found in Chapter 4.19 of this document.

These guidelines are primarily applicable to waterways that are located within the Project area and are also on USFS lands. These include an intermittent stream near Wells 55-32 and 65-32. Various historic but inactive waterways are also located in the Project area on USFS land to the west of U.S. Highway 395.

3.19.2.2 State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act, as revised in December, 2007, provides for protection of the quality of all waters of the State of California for use and enjoyment by the people of California. It further provides that all activities that may affect the quality of waters of the State shall be regulated to obtain the highest water quality that is reasonable, considering all demands being made and to be made on those waters. The Act also establishes provisions for a statewide program for the control of water quality, recognizing that waters of the state are increasingly influenced by interbasin water development projects and other statewide considerations, and that factors such as precipitation, topography, population, recreation, agriculture, industry, and economic development vary regionally within the state. The statewide program for water quality control is therefore administered most effectively on a local level, with statewide oversight. Within this framework, the Act authorizes the SWRCB and RWQCBs to oversee responsibility for the coordination and control of water quality within California, including those responsibilities under the Federal Clean Water Act that have been delegated to the state.

State Water Resources Control Board

Created by the California State Legislature in 1967, the SWRCB holds authority over water resources allocation and water quality protection within the state. The five-member SWRCB allocates water rights, adjudicates water right disputes, develops statewide water protection plans, establishes water quality standards, and guides the nine RWQCBs. The mission of SWRCB is to “preserve, enhance, and restore the quality of California’s water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.”

Lahontan Regional Water Quality Control Board

As authorized by the Porter-Cologne Water Quality Control Act, the LRWQCB’s primary function is to protect the quality of the waters within its jurisdiction for all beneficial uses. State law defines beneficial uses of California’s waters that may be protected against quality degradation to include, but not be limited to: domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. The LRWQCB implements water quality protection measures by formulating and adopting water quality control plans (referred to as basin plans, as discussed below) for specific groundwater and surface water basins, and by prescribing and enforcing requirements on all municipal, agricultural, domestic, and industrial waste discharges. The LRWQCB oversees various programs to support and provide benefit to water quality.

Basin Plans and Water Quality Objectives

The Porter-Cologne Water Quality Control Act provides for the development and periodic review of water quality control plans (basin plans) that are prepared by the regional water quality control boards. Basin plans designate beneficial uses of California's major rivers and groundwater basins, and establish narrative and numerical water quality objectives for those waters. Beneficial uses represent the services and qualities of a water body (i.e., the reasons why the water body is considered valuable), while water quality objectives represent the standards necessary to protect and support those beneficial uses. Basin plans are primarily implemented through the NPDES permitting system and by issuing waste discharge regulations to ensure that water quality objectives are met.

Basin plans provide the technical basis for determining waste discharge requirements and taking regulatory enforcement actions if deemed necessary. The Project area is located within the jurisdiction of the LRWQCB. The Water Quality Control Plan for the Lahontan Region ("Basin Plan;" LRWQCB, 2005), covers all of the Project area. The Lahontan Region considered within the Basin Plan includes over 700 lakes, 3,170 miles of streams, and 1,581 square miles of groundwater basins, including twelve major watersheds.

The Basin Plan sets water quality objectives for the surface waters in its region for the following substances and parameters: ammonia, bacteria, biostimulatory substances, chemical constituents, chlorine (total residual), color, dissolved oxygen, floating material, oil and grease, non-degradation of aquatic communities and populations, pesticides, pH, radioactivity, sediment, settleable material, suspended material, taste and odor, temperature, toxicity, and turbidity (LRWQCB, 2005). Explicit water quality objectives are provided for Mammoth Creek at U.S. Highway 395. These include (listed as average, acute): total dissolved solids (75 mg/L, 100 mg/L), chloride (1.0 mg/L, 1.4 mg/L), sulfate (6.0 mg/L, 11 mg/L), fluoride (0.1 mg/L, 0.3 mg/L), boron (0.03 mg/L, 0.05 mg/L), nitrate-N (0.4 mg/L, 0.8 mg/L), total N (0.6 mg/L, 1.0 mg/L), phosphate (0.11 mg/L, 0.22 mg/L) (LRWQCB, 2005).

Beneficial uses are designated for Mammoth Creek, Hot Creek, and Lake Crowley, as shown in Table 3.19-2. The Basin Plan does not specifically delineate beneficial uses along other waterways that are relevant to the Project Area.

NPDES General Permit for Discharges of Stormwater Associated with Construction Activities

Construction activities disturbing 1-acre or more of land are subject to the permitting requirements of the NPDES General Construction Activity Permit for Discharges of Storm Water Runoff Associated with Construction Activity (General Construction Permit). The disturbance to areas associated with construction of structures and facilities for the Proposed Action would require coverage under a General Construction Permit.

TABLE 3.19-2
DEFINED BENEFICIAL USES FOR MAMMOTH CREEK, HOT CREEK, AND LAKE CROWLEY

Beneficial Uses	Mammoth Creek	Hot Creek	Lake Crowley
Municipal and Domestic Supply (MUN)	Y	Y	Y
Agricultural Supply (AGR)	Y	Y	Y
Industrial Service Supply (IND)	N	Y	N
Groundwater Recharge (GWR)	Y	Y	N
Freshwater Replenishment (FRSH)	Y	Y	N
Navigation (NAV)	N	N	Y
Hydropower Generation (POW)	N	N	Y
Water Contact Recreation (REC-1)	Y	Y	Y
Noncontact Water Recreation (REC-2)	Y	Y	Y
Commercial and Sportfishing (COMM)	Y	Y	Y
Aquaculture (AQUA)		Y	N
Cold Freshwater Habitat (COLD)	Y	Y	Y
Wildlife Habitat (WILD)	Y	Y	Y
Rare, Threatened, or Endangered Species (RARE)	Y	Y	N
Migration of Aquatic Organisms (MIGR)	Y	Y	N
Spawning, Reproduction, and Development (SPWN)	Y	Y	Y

SOURCE: LRWQCB, 2005

On September 2, 2009, the SWRCB adopted a new General Construction Permit for Discharges of Storm Water Associated with Construction Activities. The new permit requires a risk-based permitting approach, dependent upon the likely level of risk imparted by a project. The new permit also contains several additional compliance items, including: (1) additional mandatory BMPs to reduce erosion and sedimentation, which may include incorporation of vegetated swales, setbacks and buffers, rooftop and impervious surface disconnection, bioretention cells, rain gardens, rain cisterns, implementation of pollution/ sediment/spill control plans, training, and other structural and non-structural actions; (2) sampling and monitoring for non-visible pollutants; (3) effluent monitoring and annual compliance reports; (4) development and adherence to a Rain Event Action Plan; (5) requirements for the post-construction period; (6) monitoring of soil characteristics on site; and (7) mandatory training under a specific curriculum. Under the revised permit, BMPs are incorporated into the action and monitoring requirements for each project site, as compared to the existing permit, where specific BMPs are implemented via a Storm Water Pollution Prevention Plan (SWPPP).

3.19.2.3 Local

Mammoth Community Water District

The Mammoth Community Water District (MCWD) provides water supply and sewer services to the Town of Mammoth Lakes. The MCWD uses a combination of surface water and groundwater to supply municipal customers within its service area. Groundwater supplies managed by the MCWD have been historically affected by reduced water quality in several wells, which have indicated elevated levels of hardness as well as iron and manganese at levels that exceed state municipal water supply standards. The MCWD has provided water supply treatment or blending with surface water in order to ensure that state standards are met. The MCWD operates a municipal wastewater treatment plant located just south of SR 203, approximately 0.75 mile southwest of the proposed pipeline route for the Proposed Action. The district provides recycled water within a portion of its service area.

Mono County Code Title 13 Chapter 13.08

Chapter 13.08 of the Mono County Code provides specifications and requirements relevant to land clearing, earthwork, and drainage facility installation, as relevant to projects installed within the county. The ordinance requires acquisition of a grading permit for earthwork and facilities installation within the county, and identifies fee schedules (as set by the Board of Supervisors) and procedures associated with acquisition of a permit. The ordinance specifies that drainage facilities, erosion, and pollution control devices shall be provided in order to convey surface waters to a natural channel or watercourse, or to a storm drainage facility without causing erosion, damage, or pollution, and further specifies requirements for revegetation/ground cover on slopes, drainage slopes, excavation slopes, fills, ground compaction, testing, and various other requirements that support the stabilization of soils and drainage facilities within a proposed project site.

Mono County General Plan

The ***Conservation/Open Space Element*** of the Mono County General Plan contains the following policies and actions relevant to the Proposed Action:

> ***Biological Resources Objective A, Policy 8*:** Maintain water quality for fishery habitat by enforcing the policies contained in the Water Quality and Agriculture/Grazing/Timber sections of the Conservation/Open Space Element.
>
> ***Water Resources and Water Quality Goal 1, Objective B, Policy 5*:** Future development projects shall avoid potential significant impacts to local surface and groundwater resources or mitigate impacts to a level of non-significance, unless a statement of overriding considerations is made through the EIR process.
>
>> *Action 5.1*: Future development projects with the potential to significantly impact surface or groundwater resources shall assess any potential impacts prior to project approval. Examples of potential significant impacts include:
>>
>> a. Substantially degrading or depleting surface or groundwater resources; and/or
>> b. Interfering substantially with groundwater recharge.
>
> ***Water Resources and Water Quality Goal 1, Objective C, Policy 1*:** Water intensive development proposals shall include water conservation measures as a condition of approval of the project.
>
> ***Water Resources and Water Quality Goal 2, Objective A, Policy 1*:** Future development projects shall avoid potential significant impacts to water quality in Mono County, or mitigate impacts to a level of non-significance unless a statement of overriding considerations is made through the EIR process.
>
>> *Action 1.1*: Future development projects with the potential to impact water quality significantly shall assess the potential impact(s) prior to project approval. Examples of potential significant impacts include:

a. substantially degrading water quality; and/or
b. contaminating a public water supply; and/or
c. causing substantial flooding, erosion or siltation.

***Water Resources and Water Quality Goal 2, Policy 2*:** Control erosion at construction projects.

Action 2.1: Ensure that Lahontan Regional Water Quality Control Board regulations for erosion control are met as a condition for County permit approvals.

Action 2.2: Work with Lahontan to develop standards and regulations for specific areas of the unincorporated area. Reflect these standards in applicable county regulations, such as the Grading Ordinance (Chapter 13.08).

Action 2.3: Work with Lahontan to enforce erosion control standards for development on private land.

Action 2.4: Require posting of a performance bond in compliance with the county Grading Ordinance.

Action 2.5: Work with Lahontan in the development and revision of erosion control standards.

***Water Resources and Water Quality Goal 2, Objective A, Policy 5*:** Control the release of storm water so that runoff from sites in recharge zones does not increase in volume or leave the site more rapidly than it would under natural conditions.

Action 5.1: Update the county Grading Ordinance to specify that as part of the grading permit process, developers may be required to provide hydrologic studies assessing pre-development runoff and calculating project runoff.

***Water Resources and Water Quality Goal 2, Objective A, Policy 6*:** Drill holes, such as those that are used for mining, geothermal development, and water development, shall be abandoned and plugged in conformity to state requirements for the protection of groundwater resources and public health and safety.

***Water Resources and Water Quality Goal 2, Objective B, Policy 4*:** Use of fertilizer, pesticide, and other chemicals on vegetation or soil in recharge zones should be minimized.

***Goal 2, Objective B, Policy 5*:** Assist in the management and control of toxic chemicals or other substances from extractive, industrial, manufacturing, household or commercial uses.

Action 5.2: Implement policies in the Hazardous Waste Management Element of the county's General Plan.

The ***Safety Element*** of the Mono County General Plan contains the following policies and actions relevant to the Proposed Action:

***Goal 2, Objective A, Policy 1*:** Regulate the placement of new structures in the 100-year floodplain

Action 1.4: Future development projects with the potential to cause substantial flooding, erosion, or siltation shall provide an analysis of the potential impacts prior to project approval. The analysis shall:

a. Be funded by the applicant;

b. Be prepared by a registered geologist or civil engineer;

c. Identify the nature of the hazard and assess the impacts of the development on downstream development and resources; and

d. Recommend alternatives and/or mitigation measures to mitigate potential impacts to downstream resources to a level of non-significance, unless a statement of overriding considerations is made through the EIR process.

Mitigation measures shall be included in the project plans and specifications and shall be made a condition of approval for the project.

Action 1.6: Continue to implement Mono County Code Chapter 13.08, Land Clearing, Earthwork and Drainage Facilities, and update as necessary.