United States Department of the Interior
Bureau of Land Management

United States Department of Agriculture
Forest Service

Great Basin Unified Air Pollution Control District

CASA DIABLO IV GEOTHERMAL DEVELOPMENT PROJECT

FINAL
JOINT ENVIRONMENTAL IMPACT STATEMENT AND ENVIRONMENTAL IMPACT REPORT

Volume 1

June 2013

DOI Control #: DES 12-21
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BLM

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Final
Joint Environmental Impact Statement and Environmental Impact Report
for the
Casa Diablo IV Geothermal Development Project

Volume 1

For the

BLM, Bishop Field Office

US Forest Service, Inyo National Forest

and

Great Basin Unified Air Pollution Control District

Bishop, California

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BUREAU OF LAND MANAGEMENT

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July 2013

Casa Diablo IV Project
Final EIS/EIR
(CA-170.60) P

Dear Reader:

I am pleased to announce the availability of the Joint Final Environmental Impact Statement (EIS) and Environmental Impact Report (EIR) for the Casa Diablo IV (CD-IV) Geothermal Development Project. ORNI 50 LLC, a wholly-owned subsidiary of Ormat Nevada Inc., (the Applicant) proposes to construct, operate, maintain and decommission a new 33 megawatt (MW) geothermal power generating facility and related infrastructure near Mammoth Lakes in Mono County, California.

The enclosed Joint Final EIS/EIR analyzes four alternatives, including: (1) the Proposed Project; (2) an alternative plant site, located east of the existing Casa Diablo geothermal complex; (3) a modified pipeline alignment; and (4) taking No Action.

The Joint Final EIS/EIR has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA); the Federal Land Policy and Management Act of 1976, as amended; and the California Environmental Quality Act of 1970 (CEQA). The document has been sent to organizations and members of the public who either requested a copy or commented on the proposed project during the environmental review process. The document has also been sent to pertinent local, state, tribal, and federal government entities.

To initiate the environmental review process, the Applicant submitted an application to the BLM to construct, operate, and following the expected 30-year useful life, decommission the CD-IV Project[1]. In addition to BLM authorizations required for the proposed project, the project also requires discretionary permits from the United States Forest Service (USFS), Inyo National Forest, and the Great Basin Unified Air Pollution Control District (GBUAPCD). The BLM is the lead federal agency responsible for the environmental review under the NEPA and the USFS is a cooperating federal agency; the GBUAPCD is the lead state agency responsible for the environmental review under the CEQA.

The Joint Draft EIS/EIR was circulated for a 75-day public comment period that began on November 16, 2012 and ended on January 30, 2013. Twenty-seven (27) comment letters were received during the comment period and one (1) letter was received after the close of the comment period. All 28 comment letters were considered and incorporated into the environmental review. Responses to all 28 letters are

[1] The Applicant's initial application was filed on February 17, 2010 by Mammoth Pacific, L.P. (MPLP). Since then, MPLP was acquired by Ormat Nevada Inc., which formed a wholly owned subsidiary (ORNI 50, LLC) for the CD-IV Project. ORNI 50, LLC submitted a revised application to BLM in June 2012.

provided in Appendix G of the Final EIS/EIR. Individual responses to each individual comment are provided in Appendix H.

Following release of the Joint Draft EIS/EIR, two informational public meetings were held to provide an overview of the environmental review process and to facilitate public comment on the draft EIS/EIR. The first meeting was held in Mammoth Lakes, California on December 5th, 2012. The second meeting was held in Crowley Lake, California on December 6th, 2012. One oral comment was received at these meetings.

On behalf of the BLM and cooperating agencies, I am pleased to provide this copy of the Joint Final EIS/EIR for your review and extend our appreciation for your cooperation and assistance during this process. The document will also be available on the Internet at:
http://www.blm.gov/ca/st/en/fo/bishop.html.

Sincerely,

/s/ Steven Nelson

Steven Nelson
Bishop Field Manager

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EXECUTIVE SUMMARY

ES.1 Background and Project Overview

ORNI 50 LLC, a wholly-owned subsidiary of Ormat Nevada Inc., (the Applicant) proposes to construct, operate, maintain and decommission a 33 megawatt (MW) geothermal power generating facility and related infrastructure in Mono County, California, to be known as the Casa Diablo IV Geothermal Development Project (CD-IV Project). The majority of the CD-IV Project would be developed on National Forest System Lands where the surface resources are managed by the United States Forest Service (USFS), Inyo National Forest and the mineral resources are managed by the Bureau of Land Management (BLM), Bishop Field Office. The CD-IV Project would generate and deliver geothermal-generated power to the California electrical grid through an interconnection at the Southern California Edison (SCE) Substation, thereby supporting California and the nation's mission to reduce dependency on fossil fuels.

The Applicant submitted an application to the BLM to construct, operate, and following the expected 30-year useful life, decommission the CD-IV Project[1] on February 17, 2010, which initiated the environmental review process under the National Environmental Policy Act (NEPA). 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). BLM is the lead agency under NEPA and USFS is a cooperating agency; GBUAPCD is the lead agency for review under the California Environmental Quality Act (CEQA).

The CD-IV Project would be located in the vicinity of the existing Mammoth Pacific L.P. (MPLP) geothermal complex located within the Mono-Long Valley Known Geothermal Resource Area (KGRA) near the town of Mammoth Lakes in Mono County, California. The CD-IV Project would construct a new 33 MW binary power plant, develop an expanded geothermal well field of up to 16 geothermal resource wells, 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.

[1] The Applicant's initial application was filed on February 17, 2010 by Mammoth Pacific, L.P. (MPLP). Since then, MPLP was acquired by Ormat Nevada Inc., which formed a wholly owned subsidiary (ORNI 50, LLC) for the CD-IV Project. ORNI 50, LLC submitted a revised application to BLM in June 2012.

ES.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 participating 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 the 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 February 17, 2010 and revised on June 5, 2012. The BLM may issue a Record of Decision (ROD) to approve, approve with modifications or conditions, or deny the application filed by the Applicant.

2. **USFS:** The USFS manages surface lands in the proposed project area. The CD-IV Project requires use of National Forest System Roads (NFSR) under the jurisdiction of USFS, unauthorized roads that have been created by users, new roads for access to the individual wells, and construction of a transmission line. Use of existing roads, construction of new roads, snow removal, as well as construction and operation of transmission lines requires a special use authorization (permit). The USFS will use this analysis and EIS/EIR to decide whether to approve a special use authorization, to allow for the use and occupancy of National Forest System lands as described above. In order to develop proper maintenance and operation stipulations to incorporate into the special use authorization, surface occupancy engineering drawings shall be provided to the USFS for review prior to granting authorization. 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.

ES.3 NEPA Purpose and Need and CEQA Project Objectives

ES.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 that multiple use mandate, the purpose 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 CD-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 BLM will decide whether to approve, approve with modifications or conditions, 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 various federal policies, including 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.

ES.3.2 CEQA Objectives

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 GHG emissions 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 emission 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).

ES.4 Proposed Action and Alternatives

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. Where pipelines must cross another pipeline or a road, the crossings would be underground.

4. 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.

Alternative 2, Plant Site Alternative, would locate the CD-IV power plant and related facilities to the east of the existing MPLP geothermal complex power plant facilities. Geothermal production and injection pipelines to Basalt Canyon that are located west of Highway 395 would be the same as the Proposed Action. East of Highway 395, the pipelines would proceed east to the Alternative Plant Site (rather than north as under the Proposed Action). Where pipelines must cross another pipeline, the crossings would be underground. Power plant and wellfield construction, operation and decommissioning would be the same as the Proposed Action.

Alternative 3, Modified Pipeline Alternative, modifies the geothermal production and injection pipeline alignments in Basalt Canyon, slightly alters the location of proposed well 26-30, and places pipeline crossings underground. The purpose of the alignment changes and well location change under this alternative is to minimize potential effects on biological and cultural resources and reduce potential visual effects. Power plant and wellfield construction, operation and decommissioning would be the same as the Proposed Action.

Alternative 4, No Action Alternative, would not construct the CD-IV Project. Therefore, no CD-IV-related geothermal production or injection wells, or new pipelines would be constructed in Basalt Canyon, Upper Basalt Canyon, or in Project areas east of Highway 395. In addition, the proposed geothermal power plant, substation and transmission line would not be constructed.

It is important to note that the operation of existing geothermal facilities would be unaffected by any final decision on the CD-IV Project. 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. Similarly, under the No Action Alternative, geothermal exploration in Basalt Canyon and Upper Basalt Canyon previously approved would be expected to continue. Specifically, prior approvals authorized up to ten small diameter (slim hole) and six geothermal exploratory (large diameter) geothermal wells in the Basalt Canyon and Upper Basalt Canyon area.

ES.4.1 Comparison of Alternatives

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 a 33 MW (net) geothermal power plant, up to 16 geothermal wells, and pipelines. The alternatives differ in the location of the power plant and pipelines. Table ES-1 summarizes the key differences of the alternatives.

ES.4.2 Agency Preferred 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. 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 action alternatives, because the impacts of implementing the Proposed Action would be avoided. Among the three action alternatives, Alternative 3 has been identified by GBUAPCD as the environmentally superior alternative because of the reduced environmental impacts on biological, cultural,and visual resources relative to the Proposed Action.

TABLE ES-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 ES-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 pipelines 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.

ES.5 Environmental Consequences

Table ES-2 summarizes the environmental impacts that would occur as a result of the Proposed Action and Alternatives by environmental parameter. The unavoidable adverse impacts that would remain after mitigation are also summarized.

ES.5.1 Major Conclusions

Air Resources: Construction-related emissions of NOx associated with the CD-IV Project could result in short-term exceedances of the state 1-hour and/or 8-hour air quality standards for ozone, which would result in a CEQA significant and unavoidable impact. Public health risks and nuisance odors during construction are expected to be negligible. Project operation would result in long-term exceedances of the air quality ozone standards, primarily due to fugitive n-pentane emissions at the power plant, which would result in a CEQA significant and unavoidable impact. Since the CD-IV Project would include best available technology to limit fugitive n-pentane emissions, there is no additional feasible mitigation that could substantially reduce long-term emissions.

Biological Resources – Vegetation: The CD-IV Project would affect approximately 76.4 acres of Jeffrey Pine Forest and Sagebrush Scrub vegetation communities. The Project would not affect federal or state-listed special status species, but has the potential to affect pine fritillary, a non-listed special status plant. The CD-IV Project has the potential to introduce noxious weeds and includes measures to minimize this effect.

Biological Resources – Wildlife: CD-IV Project construction and operation could affect wildlife through habitat loss, noise, or entrapment in site basins. Special-status species that could be adversely affected include northern goshawk, special-status bats, Sierra marten, and migratory birds. The Project is not expected to have substantial adverse effects on other special-status species in or downstream of the Project area. Operation of the CD-IV Project has the potential to affect Owens tui chub habitat, however it is not expected to result in an adverse effect to the Owens tui chub. Proposed pipelines could be an obstruction to wildlife movement, in particular for mule deer migration. The CD-IV Project includes measures to provide pipeline crossings if needed.

Greenhouse Gases: The CD-IV Project would displace electricity generated by fossil fuel combustion with lower GHG-emitting electricity. Operation of the CD-IV Project would be expected to displace over 89,000 metric tons of CO_2e per year, for the 30-year life of the Project.

Cultural Resources: Although CD-IV Project facilities have been designed to avoid known cultural resources, the CD-IV Project could still affect cultural resource sites and a potential National Register Historic District. Mitigation measures would ensure identification, evaluation, and where possible avoidance and protection of such resources during Project construction and operation. In consultation with the Office of Historic Preservation, the BLM is developing a Memorandum of Agreement that stresses avoidance of impacts to cultural resources.

Geothermal and Groundwater Resources: Operation of the CD-IV Project is not expected to cause substantial changes in the availability, quality, or temperature of hot springs, streams, and groundwater resources. Existing long-term monitoring of hydrologic features in Long Valley would be expanded and continue over the life of the Project.

Geologic, Soil and Mineral Resources: The CD-IV Project would not have substantial adverse effects on soil or mineral resources. Geothermal fluid extraction is not anticipated to result in land subsidence, however, because a degree of uncertainty exists, the Project would include measures to monitor potential subsidence concerns and address if necessary. Further, Project design and mitigation measures would reduce potential impacts to individuals and structures from regional seismic and volcanic hazards.

Grazing, Wild Horses and Burros: The CD-IV Project would permanently decrease the amount of grazing habitat by 15.3 acres and temporarily decrease the amount of grazing habitat by 61.1 acres.

Land Use: The CD-IV Project would be consistent with applicable land use plans and policies, with the inclusion of design and mitigation measures to reduce visual effects of proposed pipelines in scenic areas.

Noise and Vibration: Construction-related noise impacts would be audible in the vicinity of Shady Rest Park. The CD-IV Project would be below established noise threshold limits for Alternative 1. Long-term noise levels under Alternative 1 from the power plant and well pumps would be at or below ambient conditions at the nearest sensitive receptors and would be below applicable noise limits. Noise impacts from power plant construction under Alternative 2 would exceed thresholds. Long-term noise levels under Alternative 2 from the power plant could exceed nighttime noise limits at the nearest sensitive receptor, which would result in a CEQA significant and unavoidable impact.

Population and Housing: Construction and operation of the CD-IV Project would not induce growth, require the construction of new housing, or displace existing housing.

Public Health and Safety: CD-IV Project construction and operation could result in accidental releases of hazardous materials such as fuel, drilling muds, geothermal fluids, and n-pentane. Project design and emergency contingency planning would reduce the potential effect of accidental releases on public health and safety.

Recreation: CD-IV Project construction and operation could result in conflicts and potential safety hazards on roads and trails in the vicinity. The presence of Project facilities, and plowing and other road maintenance activities would alter the nature of the recreational experience. Pipelines would cross roads underground in an insulated casing to prevent snow melt and associated impacts to recreation.

Socioeconomics: CD-IV Project construction would have a positive effect on local and regional businesses in Mono County through the employment of local workers, leasing of office space, and spending by non-local construction workers on temporary lodging, food and beverage. The total economic benefits captured locally are estimated to be $13.4 million. Project operation would result in six new permanent jobs, annual spending for services and repairs, and a direct fiscal benefit of $175,000 per year to Mono County from royalties.

Transportation: The CD-IV Project is not anticipated to adversely affect traffic on regional and local roadways, traffic safety and transportation in the area.

Utilities and Public Services: The CD-IV Project is not expected to substantially increase demand for fire protection, police protection and school services or require the construction of new municipal utilities.

Visual Resources: The CD-IV power plant and pipelines would alter the existing visual landscape and would result in inconsistencies with the visual quality objectives established by USFS and BLM. The three parallel 24-inch pipelines (one existing (not CD-IV Project) and two new pipelines) and the new well facilities would be highly visible along the majority of Sawmill Road (03S25), Portions of Sawmill Cutoff Road (03S08), portions of SR 203 (county designated scenic route) and U.S. Highway 395 (State designated scenic highway). Given the high visual sensitivity of this area, the CD-IV Project would result in a substantial adverse effect on the visual character and quality of the site and its surroundings, resulting in a CEQA significant and unavoidable impact.

Water Resources: Construction and operation of the CD-IV Project could potentially affect surface water quality in the event of a major spill or release, although the Project includes measures to prevent and minimize such a potential event. Site-specific grading and erosion plans would reduce potential effects related to increased runoff and erosion.

ES.5.2 Areas of Controversy

Comments were received during the scoping process for the CD-IV Project. The scoping process and public input received during that process are provided in detail in Appendix A, *Scoping Report*. Based on input received from agencies, members of the public and others, areas of controversy related to the Project include:

Air Resources: Concerns related to potential air quality impacts as compared to ambient air quality standards. See Section 4.2, *Air Resources*.

Biological Resources: The disturbance areas associated with the Proposed Action and Alternatives consist almost entirely of native habitats, including Jeffrey Pine Forest and Sagebrush Scrub. Specific areas of controversy relating to biological resources relate to effects of habitat disturbance on wildlife, particularly special-status species including Northern Goshawk and Owens tui chub, effects on Mule Deer Migration, and appropriate mitigation measures. See Sections 4.3, *Biological Resources – Vegetation*; and 4.4, *Biological Resources – Wildlife*.

Cultural Resources: Concerns related to damage and loss of cultural and historic artifacts and other resources; including Indian sacred sites. See Section 4.6, *Cultural Resources*.

Hazards and Public Safety: Concerns related to release of geothermal fluid from wells and pipelines, hazardous gases, and fire. See Sections 4.13, *Public Health and Safety, Hazardous Materials and Fire*;

Recreation: Concerns related to recreational trail uses, and aesthetic and noise effects on recreational areas. See Section 4.14, *Recreation*.

Water Resources: Concerns generally related to surface water and groundwater availability and quality, and specifically raised concerns about potential impacts on Hot Creek and drinking water resources. See Sections 4.7, *Geothermal Resources* and 4.19, *Surface Water Resources*.

ES.6 Organizations and Persons Consulted

In addition to the scoping process, the BLM has consulted and coordinated with public agencies who may be requested to take action on the Proposed Action. Consultation and coordination that has taken place as part of the CD-IV Project is summarized below and described in detail in Chapter 6.

ES.6.1 Native American Consultation and Coordination

The BLM and USFS consult with Indian tribes on a government-to-government basis in accordance with several authorities including NEPA, NHPA §106, and Executive Order 13007 as part of its responsibilities to identify, evaluate, and resolve adverse effects on cultural resources affected by its undertakings.

ES.6.2 United States Fish and Wildlife Service

The USFWS has jurisdiction over threatened and endangered species listed under the federal Endangered Species Act (FESA) (16 USC §1531 et seq.). Consultation with the USFWS under §7 of the FESA is required for any federal action that may affect a federally listed species.

ES.6.3 California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW) protects plant and animal species listed under the California Endangered Species Act (CESA) and Fish and Game Code. Formal consultation with the CDFW is required with the state lead agency to ensure that any action it undertakes is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat. The USFWS and the Applicant will provide information to CDFW to assist the agency in its evaluation of effects on state-listed species.

TABLE ES-2
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.
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.
Biological Resources – Wildlife	Potential impacts on wildlife habitats and special status species (such as Northern goshawk, 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.
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	Same 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 also not occur.
Cultural and Paleontological Resources	Potential for impacts on historical, archaeological and paleontological resources and on human remains.	Same as the Proposed Action	Alternative 3 was designed to avoid all known cultural resources, but may have inadvertent effects on cultural resources.	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur.

TABLE ES-2 (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 the Proposed Action	Same as the Proposed Action	No impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur.
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.
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.
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 impacts associated with the construction, operation, and decommissioning of CD-IV Project would occur.
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.
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.
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.
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.

TABLE ES-2 (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
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.
Utilities and Public Services	Potential impacts during construction of stormwater drainage facilities and temporary increase in demand for potable water and water for construction and decommissioning activities.	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.
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. The smooth texture and rectilinear form of the pipelines and well facilities would be visible from several public viewpoints, resulting in some inconsistencies with the USFS Visual Quality Objectives (VQOs) at various times of the year. 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.
Surface Water Resources	Potential for degradation of water quality from accidental releases of hazardous materials 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.

ES.7 Public Participation

Scoping activities were conducted by the BLM and USFS in compliance with the requirements of NEPA and by GBUAPCD in accordance with CEQA. The scoping activities are described in detail in the *Scoping Report* provided in Appendix A. The scoping report documents the BLM Notice of Intent, GBUAPCD Notice of Preparation, the public scoping meetings, and the comments received during scoping.

The Draft EIS/EIR was circulated for public review from November 16, 2012 to January 30, 2013, during which time comments on the document were solicited. Additionally, two public meetings were held on December 5 and 6, 2012 in the Town of Mammoth Lakes and Lake Crowley, respectively.

ES.7.1 Draft EIS/EIR

The Draft EIS/EIR was distributed for public and agency review and comment on November 16, 2012; the Notice of Availability was published in the Federal Register Vol. 77, No. 222. The comment period ended January 15, 2013. In response to requests, the comment period was extended to January 30, 2013. The MCWD submitted an additional request for an extension of time to submit comments on the Draft EIS/EIR. This request was granted by the GBUAPCD for the CEQA process, however, the BLM agreed to accept late comments only to the extent practicable.

Twenty-seven comment letters were received during the comment period; one letter was received after the close of the comment period (a supplemental comment letter from MCWD, February 20, 2013). Responses to all 28 letters are provided in this Final EIS/EIR.

Section 6.4.1 describes the format and organization of the comments received on the Draft EIS/EIR and the responses to those comments. Section 6.4.2 provides a list of the comment letters received on the Draft EIS/EIR from agencies, members of the public, and organizations. Section 6.4.3 provides consolidated responses (called “Common Responses”) for topics on which a number of similar and related comments were received. Individual responses to each individual comment are provided in Appendix H.

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CHAPTER 1
Introduction

This environmental document is a joint Final Environmental Impact Statement and Final Environmental Impact Report (Final EIS/EIR). The Final 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 Final 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 Final 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 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 surface lands in the proposed project area. The CD-IV Project requires use of National Forest System Roads (NFSR) under the jurisdiction of USFS, unauthorized roads that have been created by users, new roads for access to the individual wells, and construction of a transmission line. Use of existing roads, construction of new roads, snow removal, as well as construction and operation of transmission lines requires a special use authorization (permit). The USFS will use this analysis and EIS/EIR to decide whether to approve a special use authorization, to allow for the use and occupancy of National Forest System lands as described above. In order to develop proper maintenance and operation stipulations to incorporate into the special use authorization, surface occupancy engineering drawings shall be provided to the USFS for review prior to granting authorization. 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 1.6, *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 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 (also see Section 2.1.2, Applicant Goals and Objectives). 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).

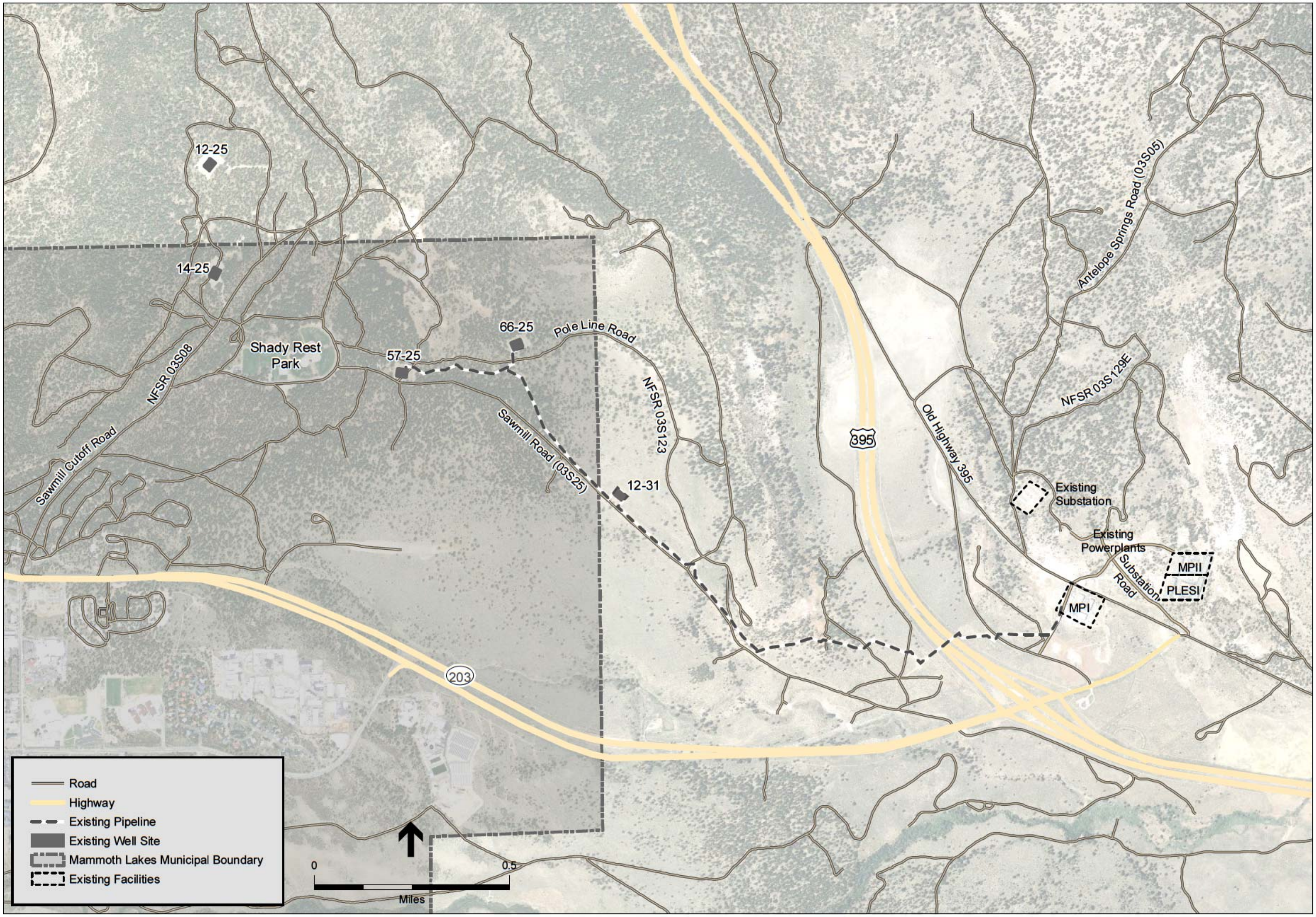
Additionally, in 2006, California adopted the Global Warming Solutions Act of 2006 (Assembly Bill 32),which set the goal of reducing statewide GHG emissions to 1990 levels by 2020 into law. It directed the California Air Resources Board (CARB) to begin developing discrete early actions to reduce greenhouse 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.

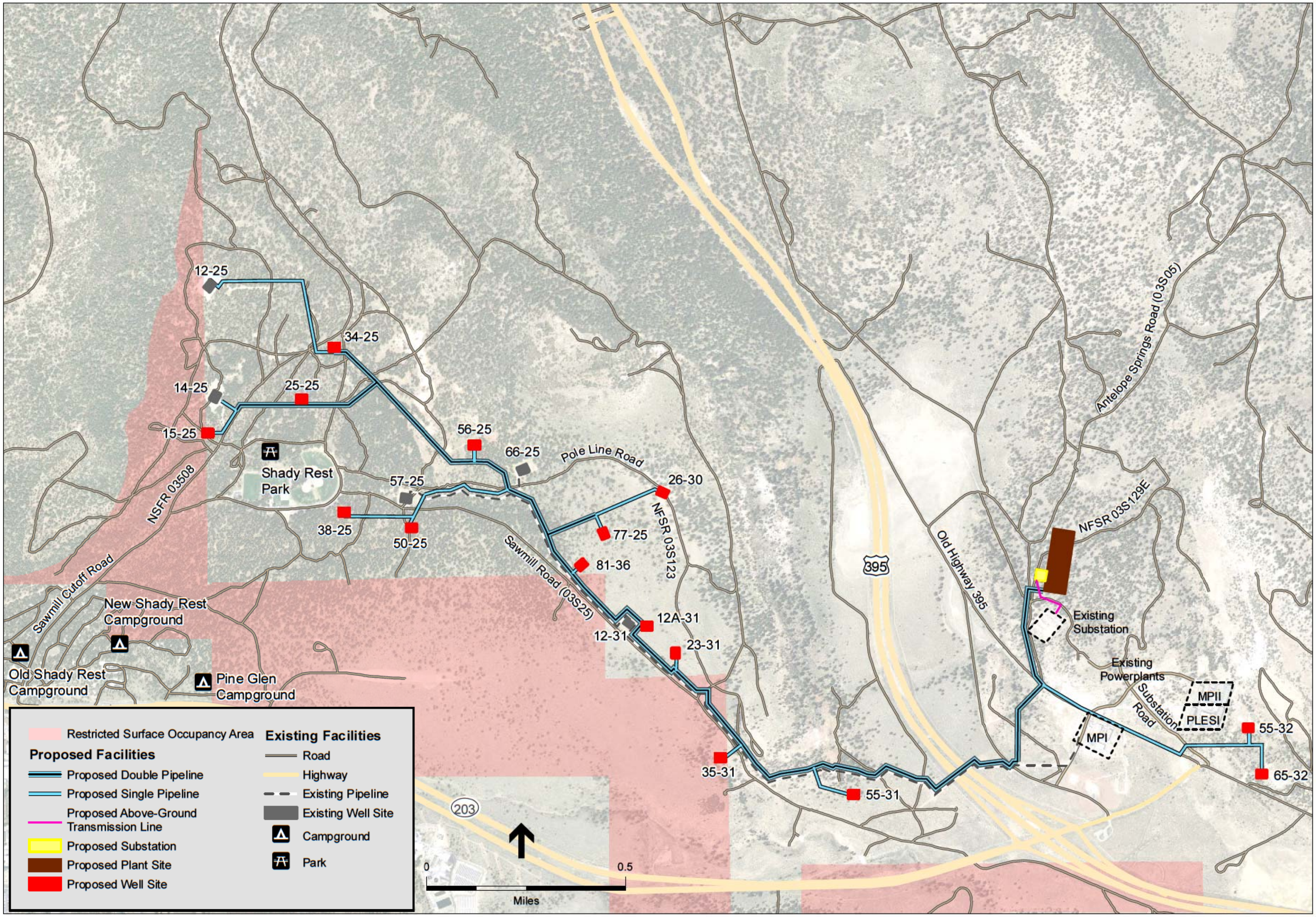
These environmental documents previously prepared for the geothermal leasing decisions are incorporated by reference into this Final EIS/EIR and listed in the list of references (Chapter 7). Summaries of the relevant information from these documents are provided in this Final EIS/EIR where applicable.

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.



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

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

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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

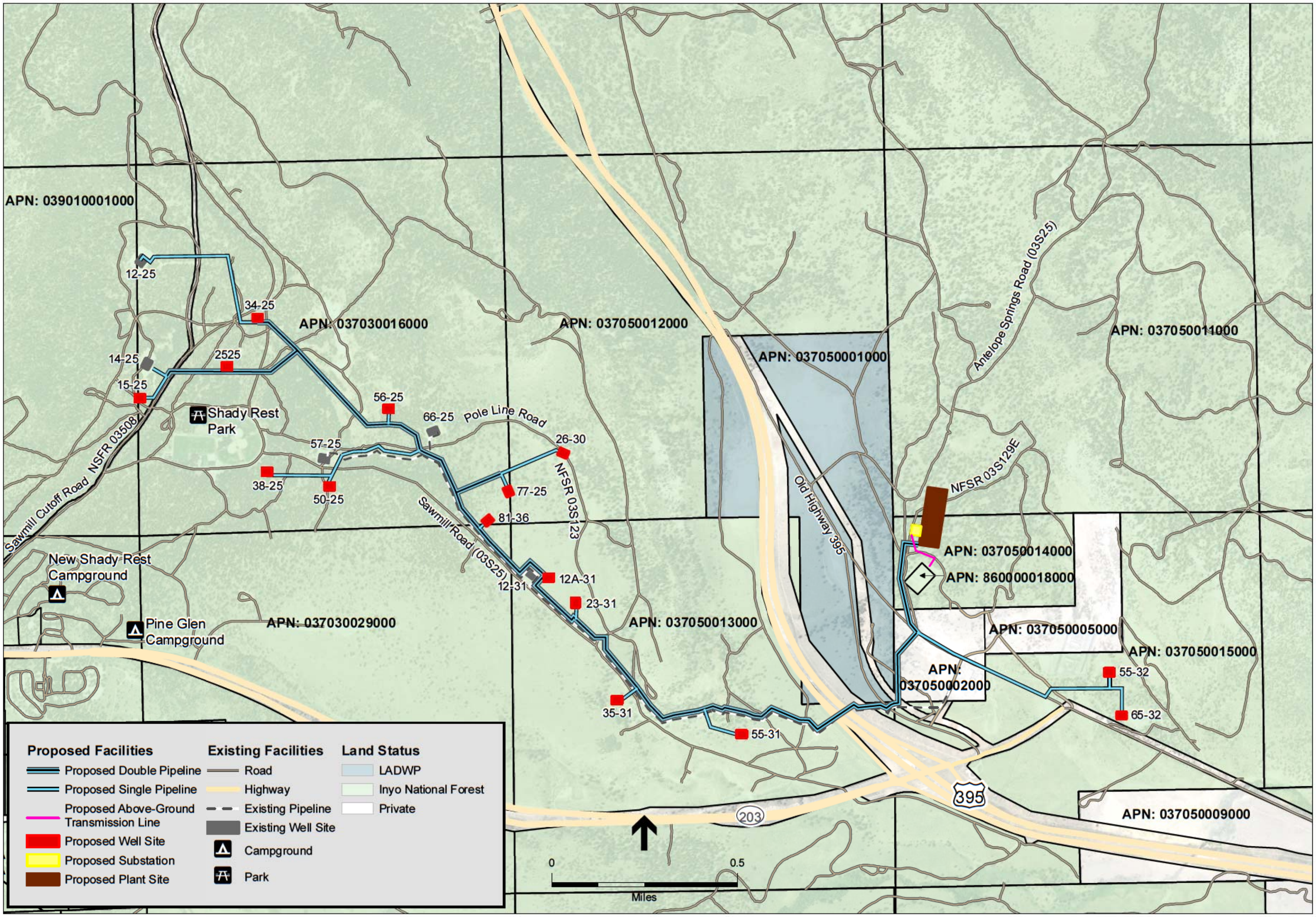
The Proposed Action would be located on National Forest System lands administered by the USFS as part of the Inyo National Forest as shown on Figure 1-3 (Land Status in the Project Vicinity). Land uses within the Inyo National Forest are governed by the 1988 Inyo National Forest Land and Resource Management 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 has and will continue to consult with the California State Historic Preservation Officer (SHPO), as required under section 106 of the National Historic Preservation Act (NHPA). The BLM, Bishop Field Office, is the lead federal agency for Endangered Species Act, Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS). The USFS is a cooperating federal agency. If the BLM, in cooperation with the USFS, determines that the Proposed Action may affect Owens tui chub or designated critical habitat, the Bishop Field Office will initiate the appropriate level of consultation with the USFWS in accordance with legal and policy requirements.

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 Final 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, including access to permitted facilities.

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 Economic Development 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.

As discussed above in Section 1.5.3.2 and further in Section 3.10.2.3, a portion of the pipeline constructed under the Proposed Action and Alternatives would be constructed within the Town of Mammoth Lakes municipal boundary and may be subject to Town of Mammoth Lakes permitting requirements, including building permits and addressing requirements, unless exempted by the USFS.

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 Wildlife (CDFW) is the state agency principally responsible for the protection and conservation of the fish and wildlife resources of the state. No CDFW 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 Final 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 Final 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 Final 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 Final 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.

1.7.3 Draft EIS/EIR

The Draft EIS/EIR was distributed for public and agency review and comment on November 16, 2012; the Notice of Availability was published in Federal Register (77 FR 68813). The comment period ended January 15, 2013. In response to requests the comment period was extended to January 30, 2013. The MCWD submitted an additional request for an extension of time to submit comments on the Draft EIS/EIR. This request was granted by the GBUAPCD for the CEQA process, however, the BLM agreed to accept late comments to the extent practicable. The supplemental comment letter from MCWD was received on February 20, 2013.

Twenty-eight comment letters were received during the comment period; one letter was received after the close of the comment period. Responses to all 28 letters are provided in this Final EIS/EIR in addition to oral comments received.

Section 6.4.1 describes the format and organization of the comments received on the Draft EIS/EIR and the responses to those comments. Section 6.4.2 provides a list of the comment letters received on the Draft EIS/EIR from agencies, members of the public, and organizations. Section 6.4.3 provides consolidated responses (called "Common Responses") for topics on which a number of similar and related comments were received. Individual responses to each individual comment are provided in Appendix H.

1.7.4 Changes to the Draft EIS/EIR

Since the Draft EIS/ EIR was published on November 16, 2012, in addition to changes resulting from comments on the Draft EIS/EIR, a few minor corrections and clarifications to the Project Description have been enacted. Further, consultation pursuant to Section 106 of the National Historic Preservation Act (Section 106) has resulted in revisions to clarify the process and further avoid impacts on cultural resources.

1.7.4.1 Section 106 Consultation

The BLM has been determined to have lead agency status for the purpose of complying with NEPA and Section 106 of the National Historic Preservation Act (Section 106), and the INF is a Cooperating Agency for NEPA and Section 106 compliance. In discussions with the Office of Historic Preservation, the BLM determined that avoidance of site surface components is desirable and possible. Since publication of the Draft EIR and based on previous and recent site surface survey findings, the BLM and INF coordinated with ORNI 50, LLC to relocate well 26-30 under Alternative 3 to avoid impact to cultural resources. The revised location is within the area of potential effect (APE) surveyed previously. This change is shown in the revised Figure 2-14. 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; all of the following Federally recognized tribes were invited to consultation: Bishop Paiute Tribe; Utu Utu Gwaitu Paiute Tribe (Benton); Big Pine Paiute Tribe; and the non Federally recognized tribe Mono Lake Kutzadika'a Paiute Indian Community, (Tribes); A Memorandum of Agreement between the OHP, BLM, Inyo National Forest, Mammoth Pacific Limited Partnership, and Great Basin Unified Air Pollution Control District outlines the mechanisms for site avoidance. The MOA also stipulates that an Historic Properties Avoidance Plan (incorporating an accidental discovery plan) be written and enacted prior to ground disturbing activities.

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. The applicant's interests and objectives, including any constraints or flexibility with respect to their proposal, help to inform an agency's decision. This information can help determine which alternatives are analyzed in detail through the NEPA process and may also provide a basis for eliminating some alternatives from detailed analysis. The alternatives must feasibly attain most of the basic objectives of the proposed project, which specifically 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 and NEPA Requirements for Alternatives Analysis

CEQA: 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.

NEPA: The Council on Environmental Quality's NEPA regulations Section 1502.14 require agencies to:

(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

(c) Include reasonable alternatives not within the jurisdiction of the lead agency.

(d) Include the alternative of no action.

(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.

(f) Include appropriate mitigation measures not already included in the proposed action or alternatives.

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.

TABLE 2-1
COMPARISON OF PROPOSED ACTION AND ALTERNATIVES

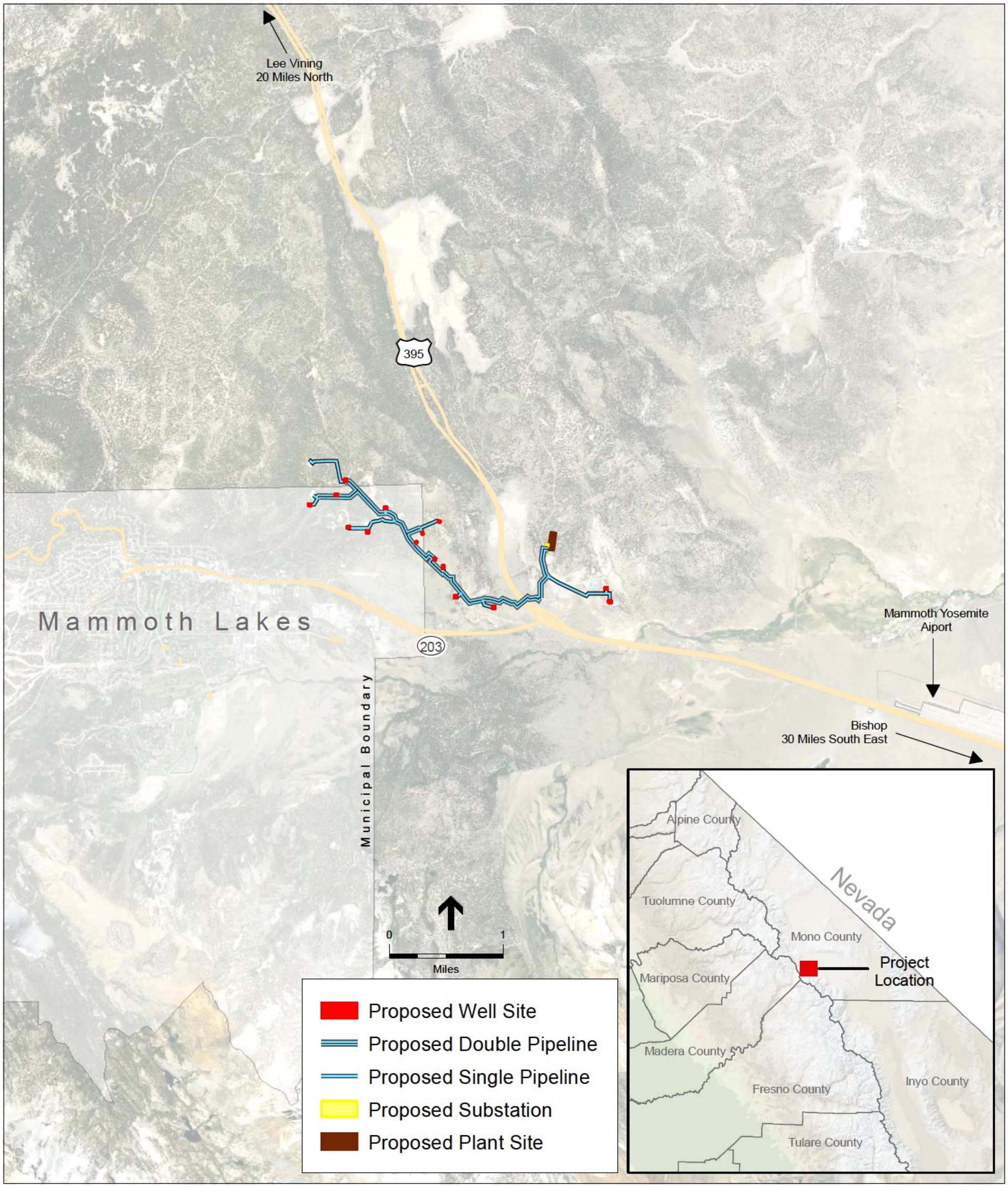
Alternative 1 – Proposed Action	Alternative 2 –Plant Site Alternative	Alternative 3 – Modified Pipeline Alternative	Alternative 4 – No Action
Power Plant Site Location			
North of SCE substation	East of existing plants and proposed Well 65-32	Same as Proposed Action	None
Power Plant Components			
Phased 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 National Forest Service Trail (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

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Figure 2-1
Project Location Map

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

   b) An Avian Powerline Interaction Committee (APLIC) compliant 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.

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

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

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Figure 2-2
Project Layout - Aerial Photograph Base

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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 CD-IV 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.

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.

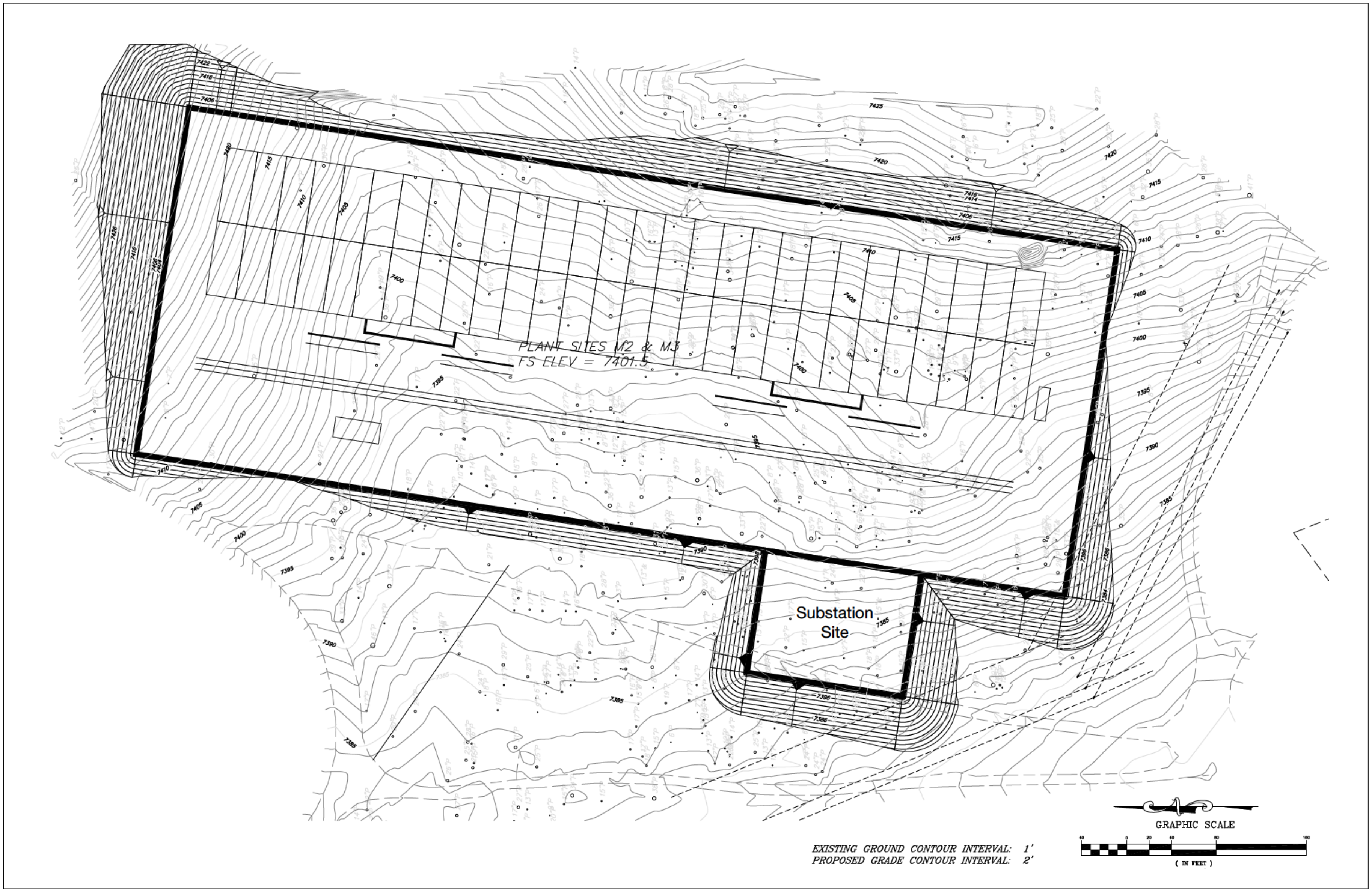
2.2.3.1 Existing and Planned Access Roads

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 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



SOURCE: Triad/Holmes Associates

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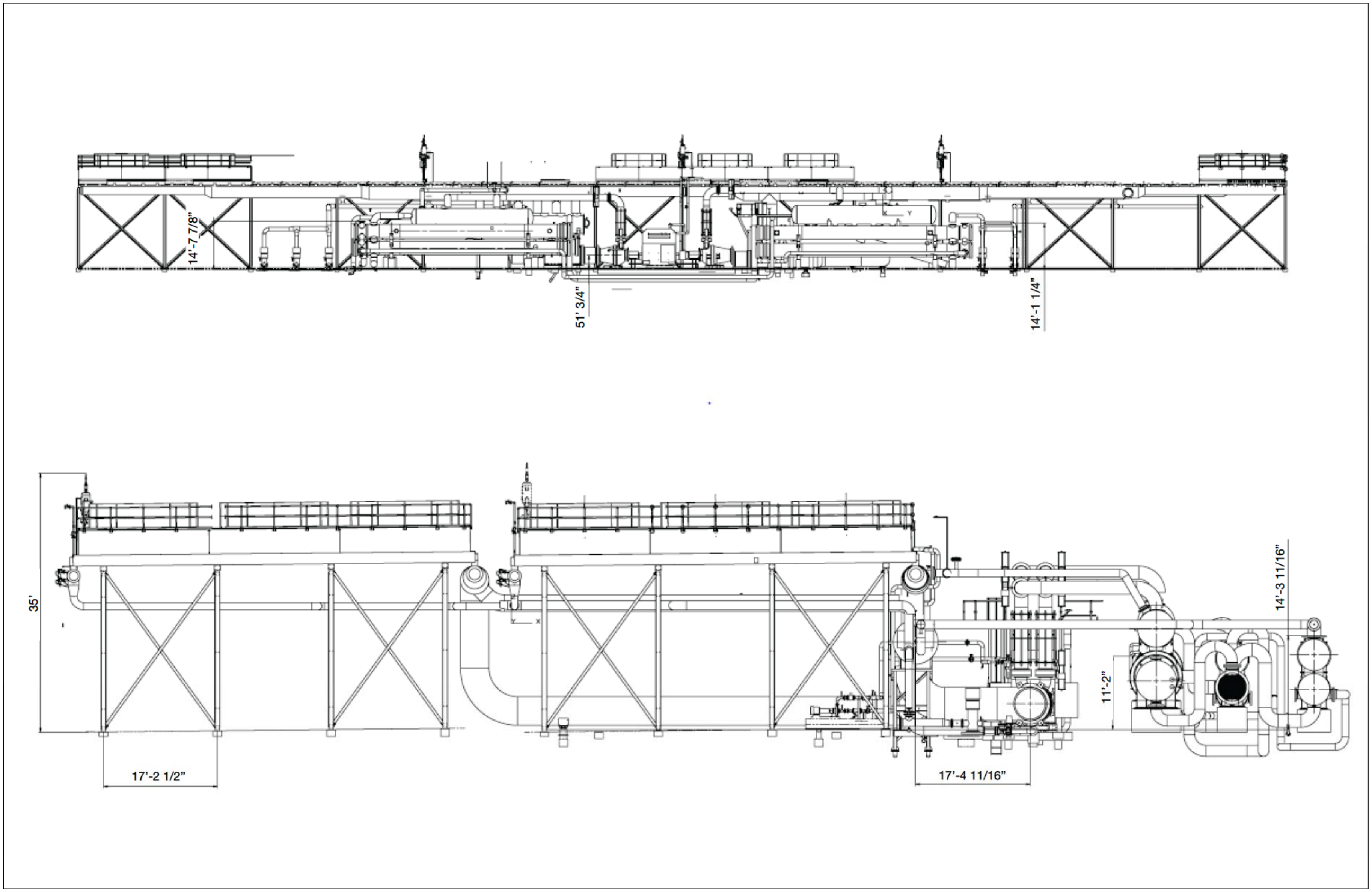
Figure 2-3
Power Plant and Substation View



SOURCE: Ormat

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Figure 2-4
Profile Views of OEC System

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.

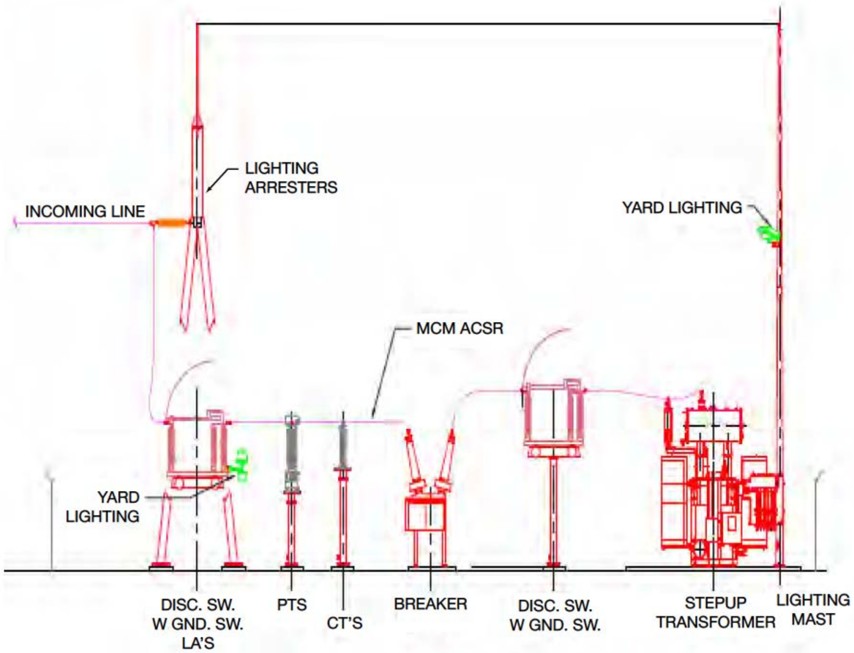
Substation

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.

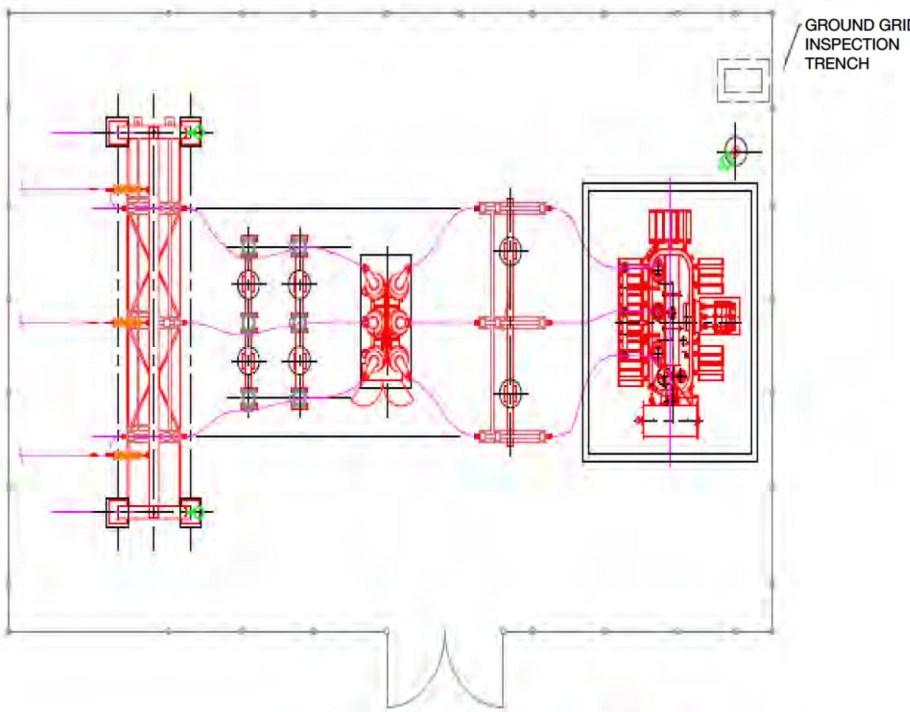
Transmission Line

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,



SUBSTATION YARD SECTION VIEW
NOT TO SCALE



SUBSTATION YARD DETAIL - PLAN VIEW
NOT TO SCALE

SOURCE: Ormat

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Figure 2-5
Typical Substation Layout

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 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.

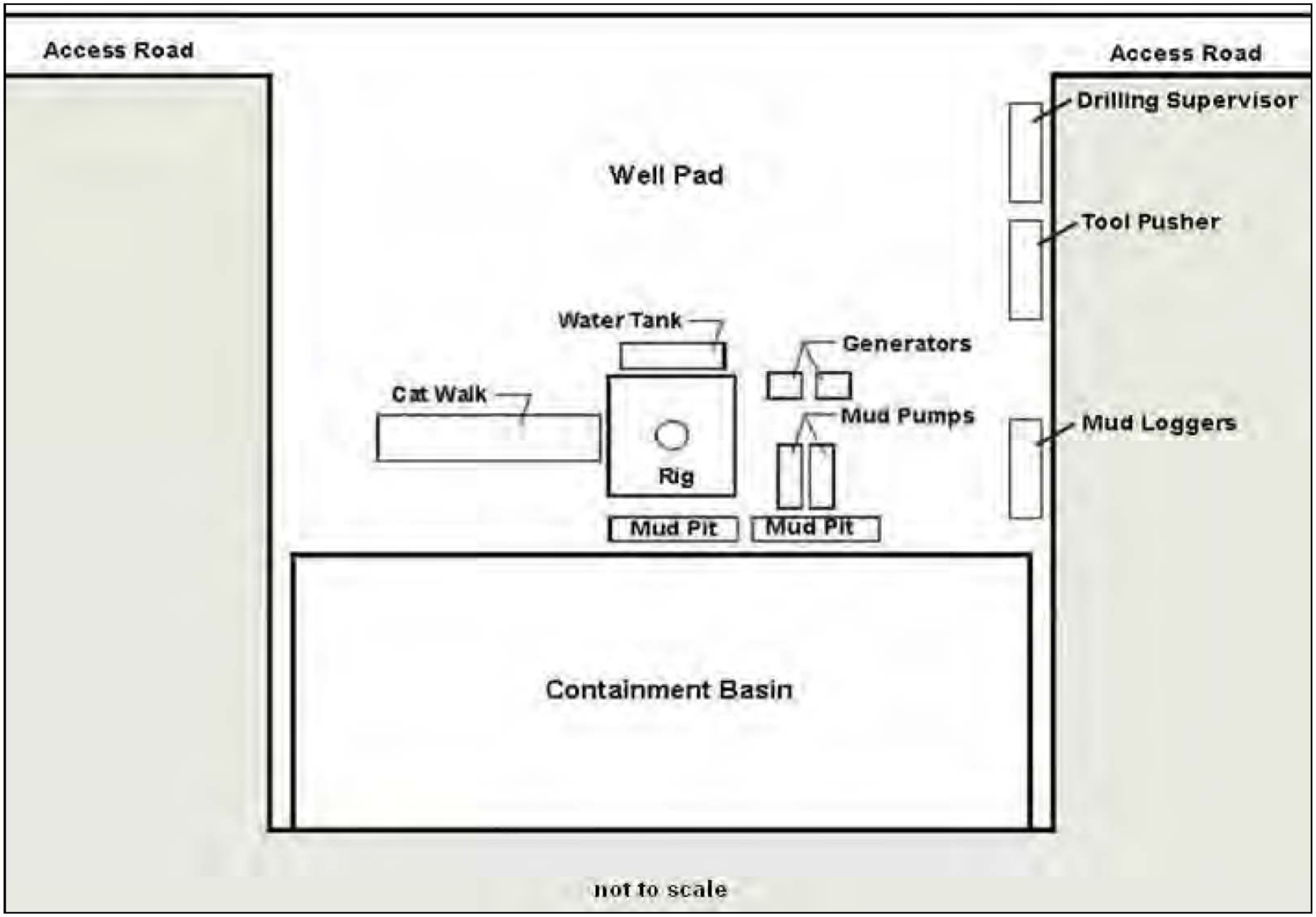
Production wellhead dimensions would not be expected to exceed a height of 15 feet above the ground surface or 4 feet in diameter. An approximately 8-foot by 20-foot by 10-foot high motor control building may be located within approximately 50 feet of each production well (see Figure 2-7). The control 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.

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



SOURCE: Ormat

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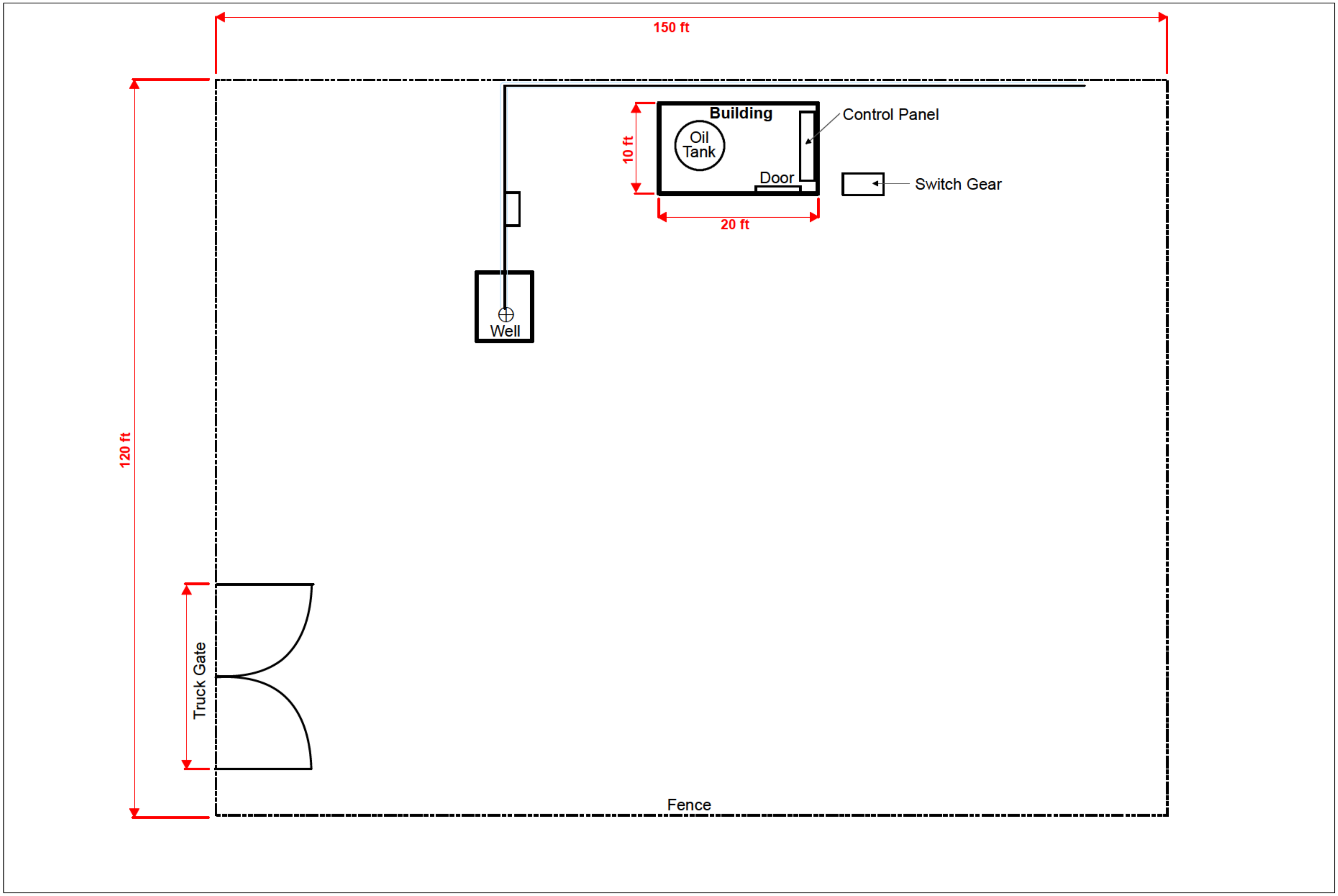
Figure 2-6
Typical Well Pad Layout During Construction



SOURCE: Ormat

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Figure 2-7

Typical Layout of a Completed Production Well Pad

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[1]), Sawmill Cutoff Road (NFSR 03S08) (maintained by the Town of Mammoth Lakes[2]), and Pole Line Road (NFSR 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 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 to motorized use following well completion (see Table 2-3 below).

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. All roads requiring all-weather access and snow plowing (those providing access to production wells) would require a hardened surface, which includes installation of aggregate, road base or paving. See Section 2.2.7.3, *Access Road Maintenance and Plowing*, for additional details on access and maintenance.

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1 Mono County maintains Sawmill Road (03S25) from near the junction of SR 203 with U.S. Highway 395 to the junction with Sawmill Cutoff Road (NFSR 03S08).

2 Under permit from the USFS, the Town of Mammoth Lakes maintains Sawmill Cutoff Road from the intersection with SR 203 to the end of the pavement near Shady Rest Park (O3S308) and Shady Rest Park access road (03S08N and 03S08P).

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 14-25	U-N 1096	This unauthorized road extends north from Sawmill Cutoff Road (03S08) to well 14-25.	This road would be added to the NFSR network.
Well 15-25	NFSR 03S35C	Extends north from Sawmill Cutoff Road (03S08), past Shady Rest Park.	Could be closed to motorized use, 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 to motorized use, if necessary.
Wells 12-31, 12A-31, and 23-31	New road segment	These three wells would be accessed by a new road segment extending northeast from Sawmill Road (03S25).	This new road would be constructed and added to the NFSR network.
Well 25-25	U-N 1109	This existing, unauthorized road extends northwest from NFSR 03S36.	This road would be added to the NFSR network.
	New road segment	This new segment would extend west from U-N 1109 to well 25-25.	This new road would be constructed and added to the NFSR network.
Well 26-30	Pole Line Road (NFSR 03S123)	Extends west and south from Shady Rest Park, north of Sawmill Road (03S25).	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.
	New road segment	This new road segment would extend northeast from Sawmill Road (03S25) to well 26-30 and Pole Line Road (NFSR 03S123). Access would also be provided to well 81-36 and 77-25.	This new road would be constructed and added to the NFSR network.
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 38-25	New road segment	A western trending new segment connecting NFSR 03S25K to well 38-25.	This new road would be constructed and added to the NFSR network.
Well 35-31	New road segment	This new road segment would extend southwest from Sawmill Road (03S25) and provide access to well 35-31.	This new road segment would be constructed and added to the NFSR network.

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

Project Component	Roads	Description	Proposed
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 55-31	New road segment	This new road segment would extend north from Sawmill Road (03S25) and provide access to well 55-31.	This new road segment would extend north from Sawmill Road (03S25) and provide access to well 55-31.
Well 55-32	U-N 1248	Existing, unauthorized road extending north east from Old Highway 395.	This road would be used to access well 55-32 and 65-32 and be added to the NFSR network.
	New road	This new road would extend east from U-N 1248 to well 5-32	This new road would be constructed and added to the NFSR network.
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.

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 (aggregate, road base or paving). 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. However, it is unknown which wells would be used for production versus injection, and therefore it is assumed for this EIS/EIR analysis that all 6.35 miles (10.2 km) of Project access roads would be plowed and improved.

As described in Table 2-3, some existing roads may be closed temporarily or permanently (to motorized use) as a result of Project implementation. Roads would be closed to motorized use 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

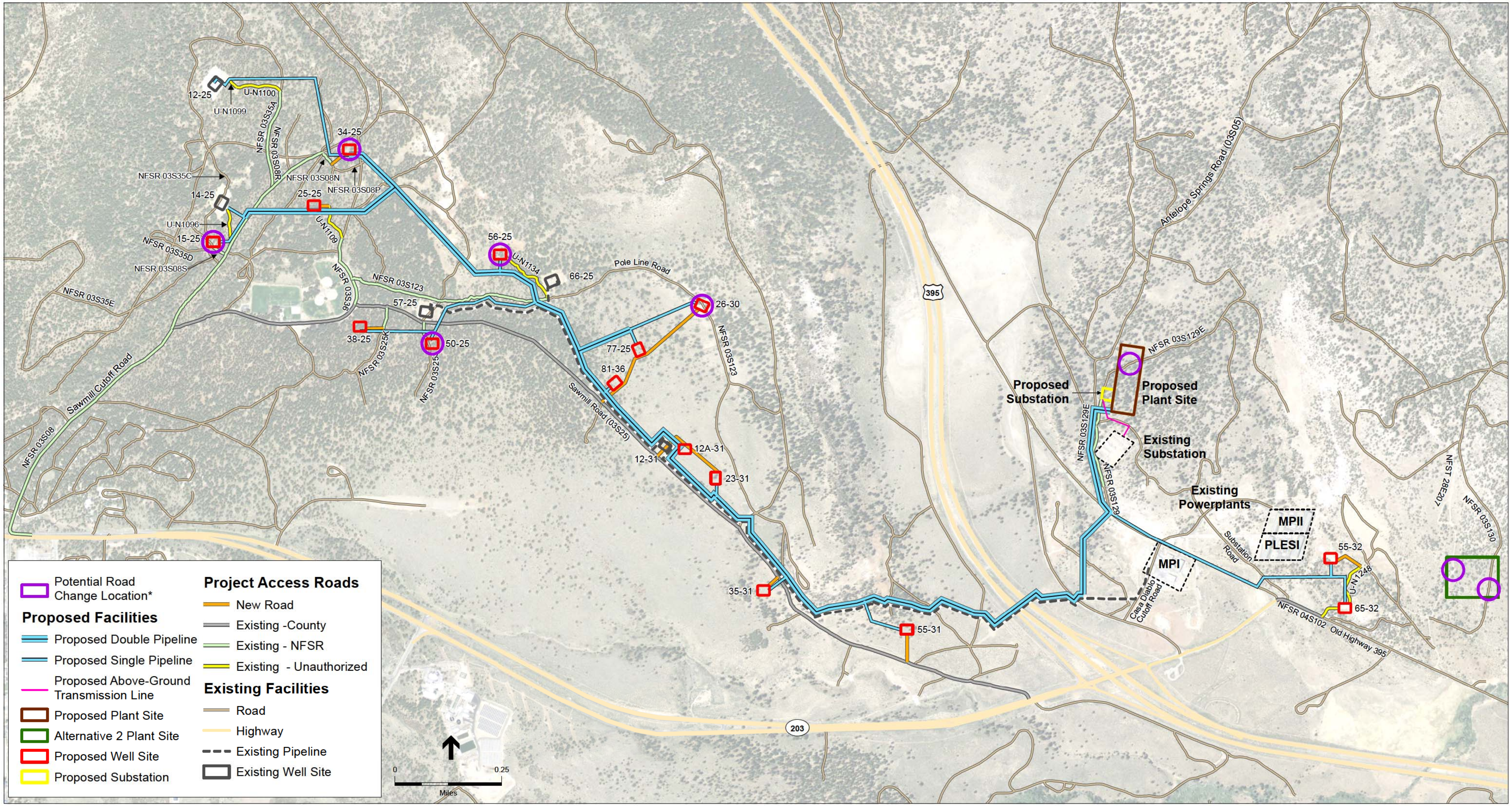
Geothermal well drilling would be conducted from the well pads described above in accordance with the procedures approved by BLM in the Geothermal Drilling Permit; typical procedures are described in this section. The BLM will be given sufficient notice by the operator (a minimum of 24 hours) to allow 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 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.



* See Table 2-3 for Road Change Information.

SOURCE: Ormat, 2010; NAIP, 2010

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Figure 2-8
Project Access Roads

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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 CD-IV 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. In areas where two Project pipelines would parallel the existing pipeline, the three pipeline corridor would be approximately 12 feet (3.7 meters) wide. In areas where two project pipelines would be constructed parallel to each other but not adjacent to the existing pipeline, the corridor would be approximately 7 feet 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).[3]

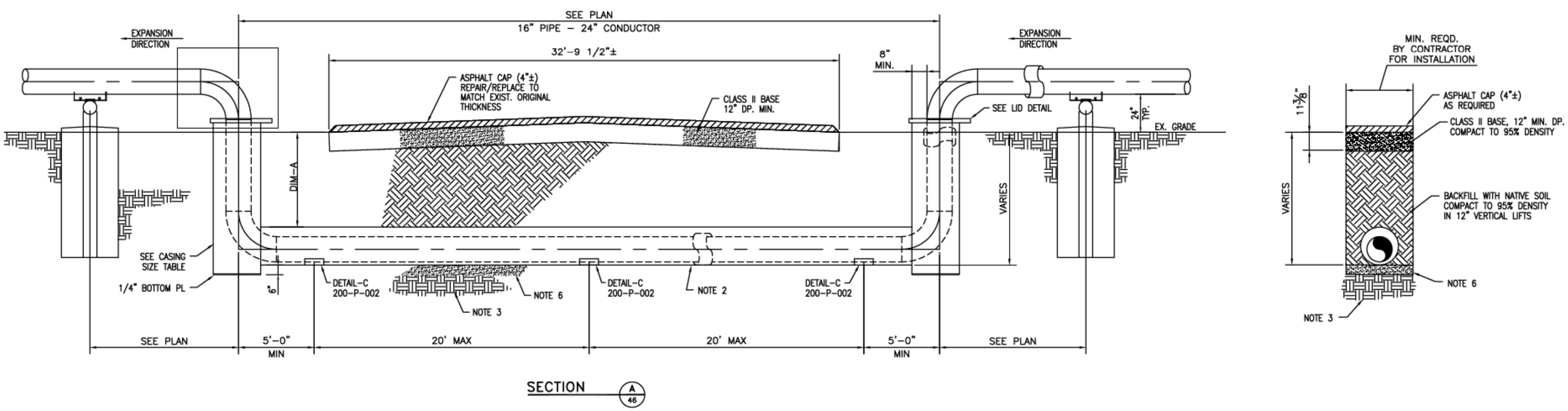
A portion of the Project pipeline alignment would be adjacent to the existing Basalt Canyon pipeline. Because some well clusters would be either production or injection, only a single production or injection pipeline would be needed to access certain wells, such as wells 12-25, 15-25, 38-25, 50-25, 57-25 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

[3] As discussed in Section 2.2.5.1, the proposed pipeline would run parallel to the existing pipeline, resulting in a triple pipeline.



SOURCE: JFMPE, Inc.

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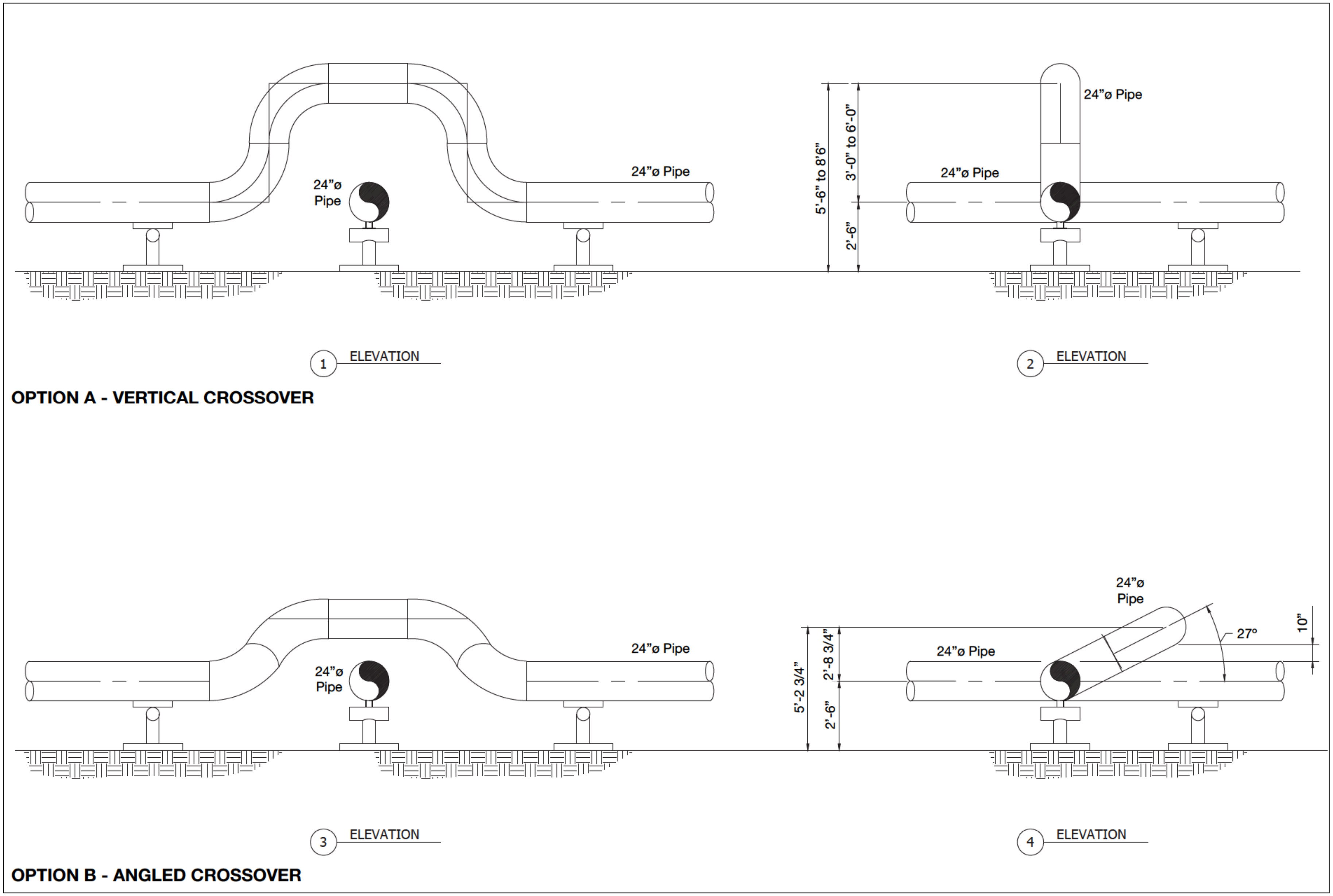
Figure 2-9
Pipeline Crossover Schematic



SOURCE: JFMPE, Inc.

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Figure 2-10
Pipeline Crossover Schematic

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, footings, and associated roadways.

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"[4] 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

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4 A sleeper is a steel framework on which the pipeline would rest.

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 “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 CD-IV 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 CD-IV 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 CD-IV 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 CD-IV 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 CD-IV 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.

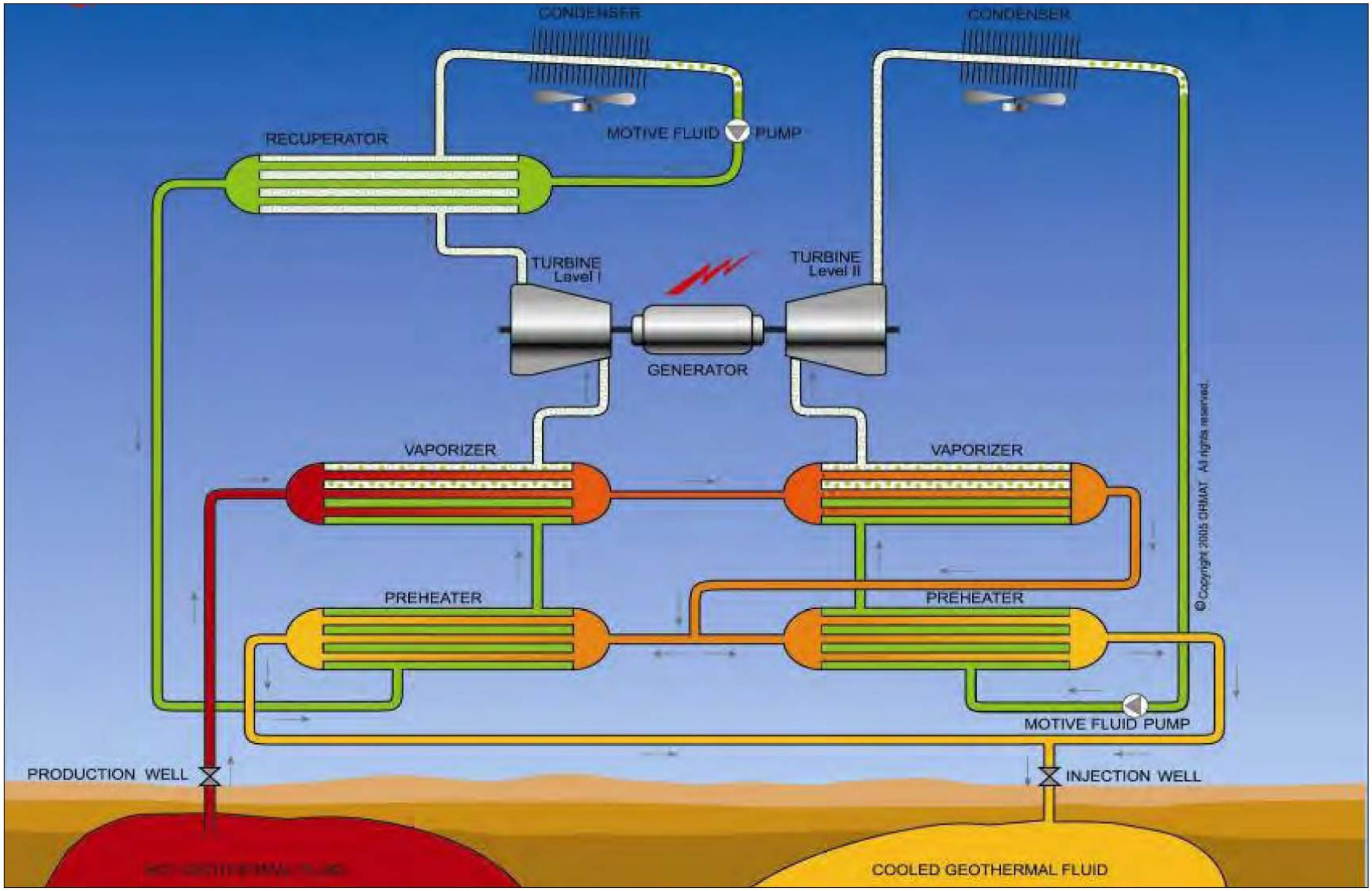
The proposed CD-IV power plant can be described as having two interdependent operating systems: (a) the geothermal fluid system; (b) the motive fluid system. Each of the two OEC units would be able to operate independently but would share common ancillary components such as n-pentane storage, geothermal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

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 CD-IV 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



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

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 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. The geothermal complex would continue to be staffed 24/7 with a combination of existing and new employees (ORNI 50 LLC, 2013).

Operational Water Demand

During operation of the CD-IV power plant, there would be no ongoing operational water needs.

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:

Land Use

1. *LU-1*: 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).

2. *LU-2*: 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*: Project vehicles will not block Sawmill Road (03S25) or Sawmill Cutoff Road (03S08) by either waiting or parking on either road.

3. *TR-3*: 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.

4. *TR-4*: 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.

5. *TR-5*: 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[5].

6. *TR-6*: All vehicle traffic will be restricted to designated access roads. Project-related vehicles will be restricted to travelling no faster than 25 mph[6] 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.

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5 PDM TR-6 has been supplemented with Mitigation Measure REC-3 (see Section 2.2.10) which requires coordination with the Town of Mammoth Lakes to ensure these areas are plowed.

6 PDM TR-7 has been supplemented with Mitigation Measures REC-1 and REC-3(see Section 2.2.10). which limit construction and operation vehicle speed to 15 mph.

Geothermal Resources

4. *GEO-4*: 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-5*: 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-6*: 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-7*: 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-3*: 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-4*: 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-5*: 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-6*: 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-7*: 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 require that all drill rig engines meet either USEPA and CARB Tier 2 or higher emissions standards for off-road engines. Prior to commencement of drilling, ORNI 50, LLC shall provide documentation to GBUAPCD that demonstrates that each drill rig will be equipped with Tier 2 and Tier 3 engines.

Mitigation Measure AQ-3: 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:

- All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized to control dust emissions using water.

- 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.
- Limit traffic speed on unpaved access roads to 15 mph and post visible speed limit signs at construction site entrances.
- Suspend excavation and grading activity when gusts produce wind speeds exceeding 20 mph.
- Reduce land disturbance activities as much as possible so that natural, stable soil conditions remain.
- The plan shall include provisions for monitoring fugitive dust based on the requirements of PDM AQ-1, and if the requirements identified in PDM AQ-1 are exceeded, construction activities shall cease until it can be determined that the requirements can be achieved.

Mitigation Measure AQ-4: ORNI 50, LLC shall monitor H_2S concentrations during all well drilling and testing at GBUAPCD-approved locations for each well location. If the well H_2S emissions exceed 2.5 kg/hr or the State's H_2S ambient air quality standard for one hour is exceeded, further venting will be curtailed until an H_2S abatement plan, approved by the GBUAPCD, is implemented to reduce H_2S well emissions below 2.5 kg/hr and the ambient concentrations below the State standard of 0.03 parts per million. The plan shall include (1) a description of the abatement technology, the degree of control expected from such technology, and the test data indicating that such degree of control can be expected in a geothermal well application; and (2) air quality analysis showing that the use of such abatement technology will not result in any violation of the State ambient air quality standard for H_2S.

Mitigation Measure AQ-5: ORNI 50, LLC shall prepare and implement an Emission Management Plan for review and approval by the GBUAPCD Air Pollution Control Officer, which shall contain the following:

- A description of the method to determine the daily n-pentane volume in the plant.
- An explanation of how to calculate n-pentane loss rates over a given period.
- An action plan for detecting and reporting breakdown events under GBUAPCD Rule 403.B, when n-pentane leaks emit more than 410 pounds per day.
- An action plan for repairing leaks associated with breakdown events. A maintenance plan for routine monitoring and prevention of n-pentane leaks.
- A format for quarterly reports on n-pentane losses and purchases. The Emissions Management Plan shall be updated as necessary in order to ensure compliance with federal, state, and/or district rules and to incorporate management plan improvements if necessary.

Mitigation Measure AQ-6: ORNI 50, LLC shall obtain a portable Volatile Organic Compound (VOC) leak detector capable of meeting the performance specifications described in USEPA's Source Test Reference Method 21. This instrument shall be properly maintained, calibrated, and made readily available at all times on the property site. The instrument shall be used at least on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, and turbine gland seals. Whenever a leak is detected that is greater than 10,000 ppmv from any aforementioned equipment, ORNI 50, LLC shall initiate repairs as soon as practical. Once a leak is discovered, ORNI 50, LLC shall tag and log its location, record the leak concentration, record the date, and record the dates of each repair attempt. A report that includes the six-month average daily emission calculations and n-pentane purchases shall be submitted electronically to the GBUAPCD within 30 days from the end of each calendar quarter. A summary record of the leak repairs made shall also be submitted to the GBUAPCD when reporting n-pentane losses.

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-2, ORNI 50, LLC shall prepare and implement a Revegetation Plan to restore all areas subject to

temporary disturbance to pre-Project grade and conditions. The Revegetation Plan will not be implemented until it is approved by an Inyo NF botanist who is familiar with the project environment and the District Ranger. 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.

6. ***Grazing.*** The USFS will ensure that grazing in the Sherwin/Deadman Sheep and Goat Allotment avoids active or revegetation monitoring areas in Basalt Canyon and Upper Basalt Canyon, as required by the Revegetation Plan (see **Mitigation Measure VEG-1.4,** above).

Mitigation Measure VEG-2: Weed Management Plan. ORNI 50, LLC shall implement a Weed Management Plan that meets the approval 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 Weed Management Plan shall include specific implementation requirements for each phase of the Project.

The Plan would be consistent with 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 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) 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, or visually verified increases occur that span two or more consecutive years of monitoring results collected at the end of the growing season. 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 VEG-3: This mitigation measure shall modify PDMs BIO-5, BIO-6, and BIO-7: All weed monitoring and weed control remediation efforts shall commence at the start of construction activities and shall continue for the duration of the permit.

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 500 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 CDFW, 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). Surveys will include both stand search and broadcast acoustical survey methodologies as described in 2000 USDA Forest Service *Protocol for the Northern Goshawk in the Pacific Southwest Region*.

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 500 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 CDFW, USFS, and USFWS although a 500-foot buffer would be used initially prior to agency consultation. 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 CDFW, 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 CDFW, 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, and monitored during spring months to ensure that water does not accumulate as snow melts. 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 CDFW approval. If indications of a hazardous materials release such as oils or surface films are observed in basins, netting or screening shall be used when basins are unstaffed to prevent access by birds and other wildlife.

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, and use cleared trees, woody vegetation, and brush materials to retain existing habitat and provide new 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 CDFW 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, underground 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). If used, overhead segments shall be of sufficient height to allow wildlife and people (or vehicles) to pass under the pipeline. Alternately, underground segments shall be a minimum of 30 feet in length. 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. The Monitoring Plan will also include details regarding methodologies to determine if the pipeline corridors are impeding wildlife movement (per PDM BIO-1) (e.g., if tracks do not cross designated crossing areas), and shall include remedial actions if impedance of wildlife movements is detected, or if the various measures proposed to promote deer crossings are not being utilized by migrating deer (e.g., installing at-grade or similar crossing structures). The Monitoring Plan shall also include performance measures for determining if the various deer crossing measures proposed are meeting their goals. At a minimum, monitored elements shall include: 1) a pre- and post- construction deer movement study that employs remote camera stations that is capable of determining whether or not deer use remains relatively constant or declines measurably following construction; 2) an assessment of available crossing sites to determine whether or not deer are using the provided above ground or underground sections; and 3) the success of any remedial actions, if needed (for example, the success of additional created at-grade structures), to facilitate deer movement through the Casa Diablo complex. As a result of post-project monitoring studies, any indications that changes to the environment resulting from the project result in significantly greater (e.g., >25 percent above baseline) vehicle-related mule deer mortality or significantly reduced on-site deer population size or habitat use that cannot otherwise be explained by environmental factors shall warrant the incorporation of additional measures such as the one-by-one construction of at-grade or similar deer crossing structures at key locations to reduce impacts on deer movement.

Mitigation Measure WIL 7: The following measures are required to protect mule deer and general wildlife:

a) External safety lighting associated with project construction and operations shall be designed to minimize effects to wildlife and lighting of natural habitat at night. Operational lighting at the plant site and well sites would be directed downward and shielded, or directed inward away from natural habitat and wildlife movement corridors.

b) To the maximum extent feasible, all noise-generating construction activities on project linear corridors shall be limited to daylight hours.

c) During construction and decommissioning, solid waste materials (trash) would be stored in containers that are inaccessible to wildlife. Trash shall be routinely collected and deposited at an authorized landfill to avoid attracting predators to the project area.

Mitigation Measure WIL-8: Conduct Pre-construction Bat Surveys. If construction, grading or other Project-related activities are scheduled during the breeding season of native bat species (April 1 to August 31), pre-construction surveys shall be conducted prior to the initiation of construction by a qualified wildlife biologist to determine whether active roosts are present on site or within 50 feet of Project activities. Field surveys shall be conducted early in the breeding season before any construction activities begin, when bats are establishing maternity roosts but before pregnant females give birth (April through early May). If no roosting bats are found, then no further mitigation is required. If roosting bats are found, then disturbance of the maternity roosts shall be avoided by halting construction until the end of the breeding season or a qualified bat biologist removes and relocates the roosting bats in consultation with CDFW.

Mitigation Measure WIL-9: Conform to Avian Power Line Interaction Committee Guidelines. Electric distribution poles or towers being modified or integrated with the Project shall be compliant with measures defined by the Avian Power Line Interaction Committee (APLIC).

Mitigation Measure WIL-10: Owens Tui Chub Habitat and Population Monitoring. Prior to commercial production or injection of geothermal resources, the Applicant shall develop and implement an Owens Tui Chub Population and Habitat Monitoring Plan and amend the existing Remedial Action Plan, in coordination with the BLM. CDFW and USFWS would be invited to participate in the development and implementation of the plan. The Population and Habitat Monitoring Plan and amendment to the Remedial Action Plan shall be approved by BLM, CDFW, and USFWS prior to implementation. The Plans are intended to identify and quantify potential changes to fish habitat and populations at AB and CD springs and Little Hot Creek Pond. The plans shall include the following measures:

a) Conduct baseline (year zero) and ongoing fish surveys using CDFW and USFWS-approved survey methods in portions of the AB/CD springs, and Little Hot Creek Pond where water quality changes could potentially affect Owens tui chub habitat or populations;

b) Collect baseline (year zero) benthic macroinvertebrate (BMI) samples at the same sampling sites and dates as the fish surveys described above, and periodically concurrent with fish surveys after the initial collection;

c) Conduct a baseline (year zero) and periodic stream habitat assessments in accordance with agency-approved survey protocols. These assessments shall include a quantitative evaluation of physical stream characteristics, and aquatic and riparian vegetation;

d) Incorporate the collected population and habitat data into an analysis and discussion of water quality data collected in AB and CD springs, and Little Hot Creek Pond such as field measurements for air and water temperature, conductivity, dissolved oxygen (concentration and percent saturation), flow, turbidity, and hydrogen ion concentration (pH). Additional parameters may include, but are not limited to, sampling for total suspended solids (TSS), hardness, aluminum, and chromium to be collected, preserved, and sent to a certified analytical laboratory for analysis.

e) Prepare an annual data report summarizing the current year's survey and sampling results, including analyses of trends and conditions. A draft report will be made available for BLM review by December 31 of each year. The summary report will also include an analysis and discussion of water quality data. The report will be provided to CDFW and USFWS for review.

f) Amend the existing Remedial Action Prog to include measures specific to changes in Owens tui chub populations and primary constituent elements, such as aquatic vegetation, water quality, and an adequate insect prey base.

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 Avoidance Plan; and 8) Tribal consultation and participation.

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 Historic Properties Avoidance Plan shall be developed and included in the MOA that defines and maps all known cultural resources within 150 feet of the project APE. That Plan shall also detail how resources will be marked and protected as Environmentally Sensitive Areas during construction. The Plan shall detail provisions for monitoring construction in locations deemed to be high-sensitivity areas for buried sites currently without surface manifestations. 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 Historic Properties Avoidance Plan 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 Historic Properties Avoidance Plan 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

None required.

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 subsidence monitoring program conducted by the USGS will be reviewed by the USGS and LVHAC members to ensure adequate subsidence monitoring is conducted for the CD-IV project. Based on recommendations by the USGS and LVHAC members, the subsidence monitoring program would 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. If additional subsidence monitoring is deemed necessary, the project applicant would develop a monitoring plan. The monitoring plan would include subsidence and uplift tolerances for potential impacts to infrastructure and resources, and shall prescribe particular actions (e.g., require discontinued or reduced pumping rates) in the event tolerances are exceeded. Additional monitoring may include installation of new or updated monitoring equipment 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

Mitigation Measure NO-1: ORNI 50, LLC shall prepare and implement a Noise Management Plan to ensure that operational noise levels associated with CD-IV Project well pumps do not increase ambient noise levels at Shady Rest Park by more than 3 dBA. The plan shall be submitted to USFS for review and approval prior to the commencement of well pump operations. The plan shall include a proposal designed by an acoustical engineer to perform baseline noise measurements at Shady Rest Park at locations developed through consultation with USFS and the Town of Mammoth Lakes. The plan shall include a requirement for an acoustical engineer to collect additional measurements at the same locations as the baseline survey once the well pumps are operational to verify that well pump noise levels do not increase ambient noise levels by more than 3 dBA. The plan shall identify specific acoustical engineer-recommended measures to be implemented by ORNI 50, LLC in order to reduce noise levels to within 3 dBA of baseline conditions if the measurements that include pump operations exceed the baseline measurements by more than 3 dBA. Noise control techniques may include, but not be limited to: locating the well pump within an enclosed concrete building, use of noise walls or equivalent sound attenuation structures, and the use of pumps and equipment with special noise control specifications designed to specifically achieve the desired noise reductions.

The plan shall require an acoustical engineer to take additional noise measurements after the noise reduction improvements are implemented to ensure the required noise level is met. In the event that the measured noise levels still exceed the baseline level by more than 3 dBA, additional noise control techniques shall be initiated to correct the violation.

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, but not limited to: nearby recreation sites / campgrounds, access points, the Mammoth Lakes Trail System website, 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. Signage shall be designed to function during winter and non-winter conditions, and shall be consistent with USFS and Town of Mammoth signage requirements, as appropriate. 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, but not limited to: nearby recreation sites / campgrounds, access points, the Mammoth Lakes Trail System website, and the Mammoth Lakes Visitor Center. Signage shall be designed to function during winter and non-winter conditions, and shall be consistent with USFS and Town of Mammoth signage requirements, as appropriate. 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 a Shady Rest OSV staging area and access to the staging area is plowed to provide winter access. In addition, banks formed by road plowing shall be shaped such that crossing grade changes are gradual in areas where cross country use is prevalent.

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 or better 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. The landscape plan shall be coordinated with the revegetation plan (refer to **Mitigation Measure VEG-1**) including a monitoring and reporting plan. Permanent fencing shall be precluded to reduce potential barriers to wildlife. To minimize adverse visual effects from the abovementioned roads and park, ORNI 50, LLC shall landscape the following areas such that direct views and corners of the well facilities and pipeline are at least 65% obstructed from any location within a ten-year period. Monitoring at the end of the third growing season shall be conducted to determine if success standards are being met. If it is determined that success standards are not being met, ORNI 50, LLC shall take immediate action to re-implement the Landscape Plan to ensure compliance by the tenth-year period. At the following sites, ORNI 50, LLC shall also 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 (NFSR 03S123) (near well facility sites 56-25,66-25, 77-25, 81-36, 12A-31, 23-31, 35-31, and 55-31)

Once the locations of proposed crossovers and expansion loops are determined, the need for implementing this measure will be determined.

Mitigation Measure VIS-2: Pipeline Crossovers and Expansion Loops. At locations where one pipeline crosses over another adjacent to Sawmill Road (03S25) and Pole Line Road (NFSR 03S123) (near well facility sites 56-25,66-25, 77-25, 81-36, 12A-31, 23-31, 35-31, and 55-31) and where the terrain is not a constraining factor, ORNI 50, LLC shall reduce the height of crossovers and expansion loops by:

a. Lowering the existing pipeline or new pipeline (whichever is easiest) belowground or within a 3-foot deep trench and design the pipeline crossover with pairs of 30, 45 or 90 degree ells to ensure that the overall height of the crossover is at or below 5.5 feet aboveground.

b. All expansion loops shall be horizontal to minimize overall height of installed pipelines to less than 5.5 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 (03S05). The landscape plan shall be coordinated with the revegetation plan (refer to **Mitigation Measure VEG-1**) including a monitoring and reporting plan. ORNI50, LLC shall landscape the area immediately adjacent to Antelope Springs Road and at select locations such that direct views and corners of the power plant are at least 65% obstructed from any location within a ten-year period. Monitoring shall be conducted at the end of the fifth growing season to determine whether success standards are being met. If it is determined that success standards are not being met, ORNI 50, LLC shall take immediate action to re-implement the Landscape Plan to ensure compliance by the tenth-year period.

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 at least one foot of 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.

Mitigation Measure SW-7: This mitigation measure shall modify PDM HYD-2 – To the extent feasible, the pipeline route and any access roads shall avoid RCAs. Any additional action, requirements, and/or designations with respect to RCAs shall be based upon guidance from USFS staff and consistent with the relevant USFS policy.

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 4,888 feet (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.

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

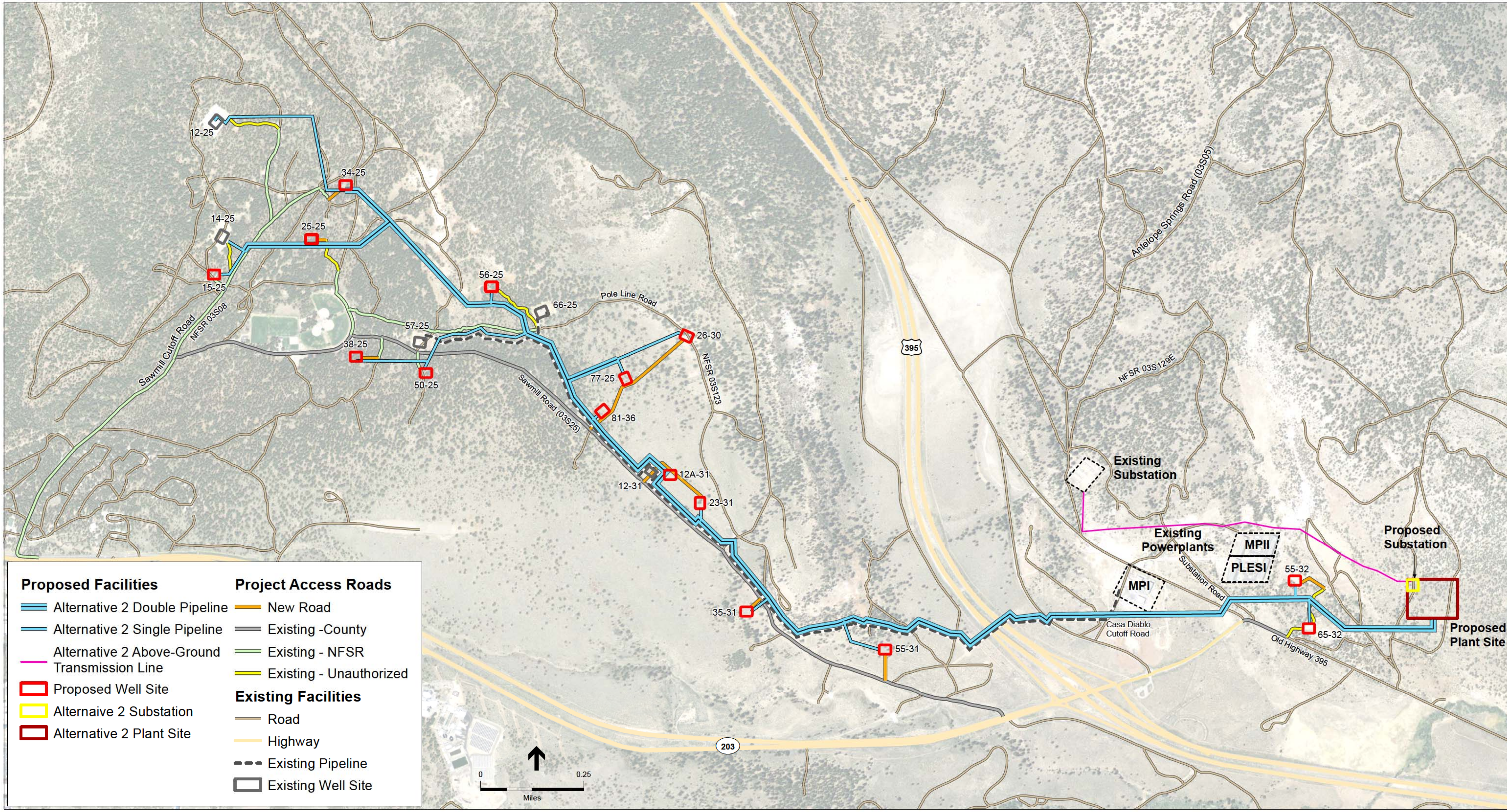
The geothermal fluid produced from the production wells would be conveyed to the alternative power plant site in a pipeline from the wellfield to U.S. Highway 395, and would cross under U.S. Highway 395, as described for the Proposed Action. East of U.S. Highway 395, the pipeline would proceed east to 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.



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

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Figure 2-13
Alternative 2 Layout

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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.
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

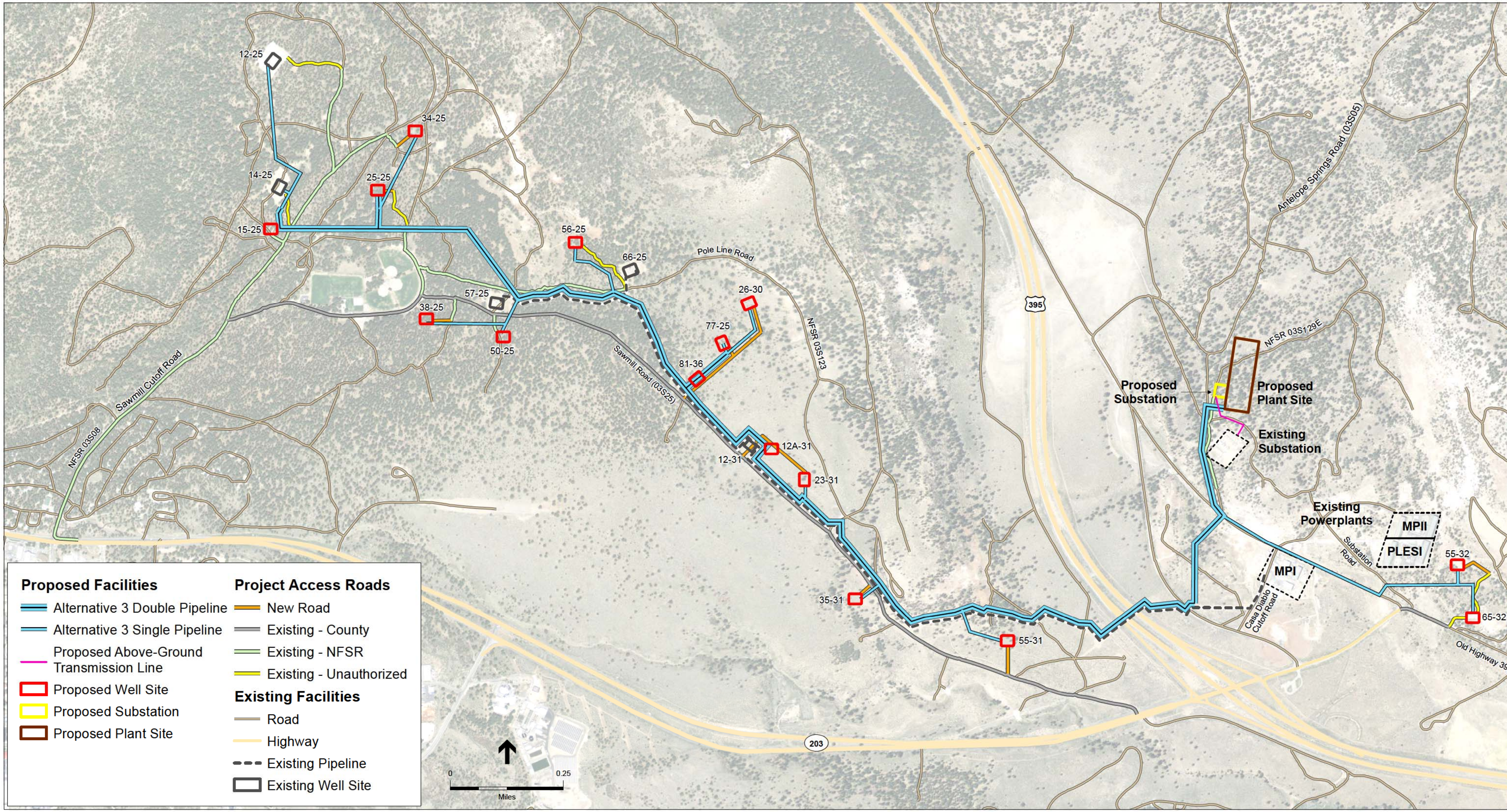
At locations where a new pipeline must cross the existing pipeline, a production or injection pipeline, or both, the pipeline crossings would be underground. The construction of undercrossings would be by trench excavation cut-and-fill method, as described in Section 2.2.5.4 for the road undercrossings.

2.4.3.4 Access Roads

Improvement of existing roads and construction of new access roads to provide access to the geothermal 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 CD-IV Project, including the proposed geothermal power plant, geothermal wells, and pipelines, would not be constructed. Therefore, no CD-IV-related geothermal production or injection wells, or new pipelines would be constructed in Basalt Canyon, Upper Basalt Canyon, or in Project areas east of Highway 395. In addition, the proposed geothermal power plant, substation and transmission line would not be constructed.



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

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

Figure 2-14
Alternative 3 Layout

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However, it should be noted that the operation of existing geothermal facilities would be unaffected by any final decision on the CD-IV Project and continue on consistent with existing approvals for those activities. 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. Similarly, under the No Action Alternative, previously approved geothermal exploration in Basalt Canyon and Upper Basalt Canyon would be expected to continue. Specifically, prior approvals authorized up to ten small diameter (slim hole) and six geothermal exploratory (large diameter) geothermal wells (Figure 2-15) in the Basalt Canyon and Upper Basalt Canyon area. Table 2-2 shows all of the identified well sites in the area and describes which have been already approved for exploratory drilling. One of the ten small diameter wells (12-31) and four of the large diameter wells have been drilled (Table 2-2). Under the No Action Alternative, while no activities related to the Proposed Action would occur, nine additional small diameter and two large diameter exploratory wells shown in Figure 2-15 could be drilled, It should be noted that not all of the well locations shown on Table2-2 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.

TABLE 2-4
COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

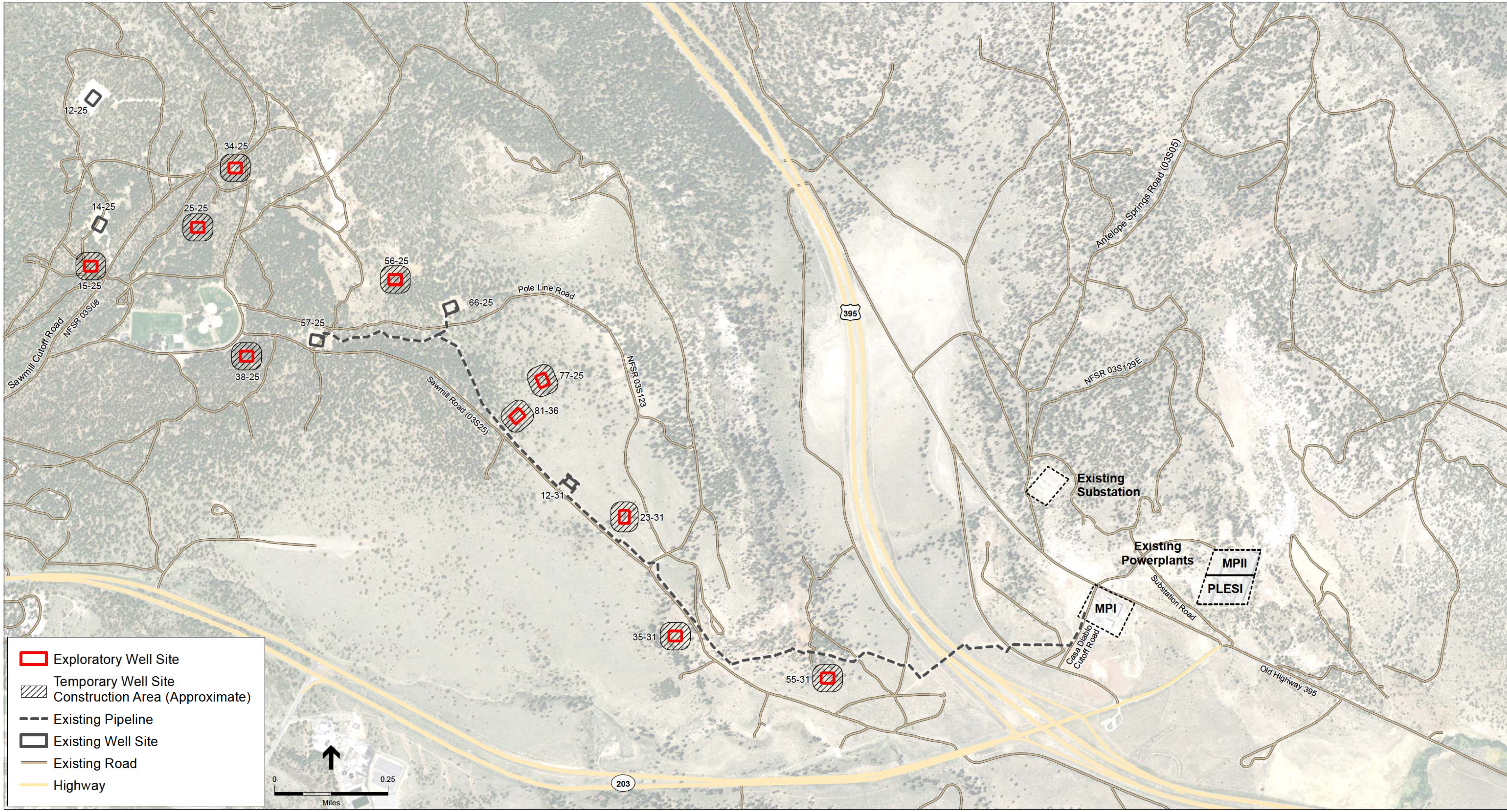
Resource	Alternative 1 Proposed Action	Alternative 2 Alternative Plant Site	Alternative 3 Modified Pipeline Alternative	Alternative 4 No Action
Air Resources	Short-term unavoidable construction and long-term operation impacts related to contributing to exceedances of the state 1-hour and/or 8-hour ozone 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.
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.
Biological Resources – Wildlife	Potential impacts on wildlife habitats and special status species (such as Northern goshawk, 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.
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.

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.
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.
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.
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.
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.
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.

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
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.
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.
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.



SOURCE: Ormat, 2010; NAIP, 2010

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

Figure 2-15
No Action Alternative

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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[1], 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,

[1] LADWP has purchased Chance Ranch and it is speculated that no one currently lives there. However, for the purposes of this analysis, it is considered a sensitive receptor as individuals are not precluded from staying at the residence for extended periods of time.

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, established triggers for no burn days, and reduced emissions from re-entrained road cinders (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)

Town of Mammoth Lakes Municipal Code

Chapter 8.30 of the Town of Mammoth Lakes Municipal Code largely implements mitigation measures proposed in the Air Quality Management Plan for the Town of Mammoth Lakes. The majority of this chapter does not apply to the CD-IV Project as it establishes standards and requirements for solid fuel appliances and the CD-IV Project does not propose the use of any solid fuel appliances. Section 8.30.100 requires the Town of Mammoth Lakes to undertake a street sweeping program to reduce PM10 emissions resulting from excess accumulation of cinders and dirt. This chapter directs the Town to reduce vehicle miles traveled (VMT) associated with a project through its review of proposed development projects.

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; 2012a);
2. A delineation of wetlands and waters of the U.S. (Paulus, 2012b);
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, proposed access roads, and a 300-foot wide survey corridor for pipeline routes.

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; 2012a). 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 2012a
Alternative 2 Power Plant Site	Jeffrey Pine Forest (60%) Sagebrush Scrub (40%) (approximately)		Review of aerial photographs and site reconnaissance; Paulus 2012a
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%)	Cheatgrass present.	Paulus 2008; Paulus 2009e
Well 50-25			Paulus 2012a
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%)	Cheatgrass present.	Paulus 2008; Paulus 2009d
Well 77-25	Sagebrush Scrub (60%) Jeffrey Pine Forest (40%)	Pine fritillary present. Cheatgrass present.	Paulus 2009e
Well 26-30	Sagebrush Scrub (85%) Jeffrey Pine Forest (15%)		Paulus 2009f
Well 12-31	Sagebrush Scrub (100%)	Cheatgrass present.	Paulus 2008; Paulus 2009d
Well 12A-31	Sagebrush Scrub (100%)		Paulus 2009d
Well 23-31	Sagebrush Scrub (100%)	Cheatgrass present.	Paulus 2008; Paulus 2009d
Well 35-31	Sagebrush Scrub (90%) Jeffrey Pine Forest (10%)	Cheatgrass present.	Paulus 2008; Paulus 2009d
Well 55-31	Sagebrush Scrub (95%) Jeffrey Pine Forest (5%)	Cheatgrass 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	Cheatgrass present.	Paulus 2009c Paulus 2009b Paulus 2009f
Alternative 3 – Modified Pipeline Alignment	Sagebrush Scrub	Cheatgrass and Russian thistle present.	Paulus 2010

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[1] 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, which was introduced to control erosion, has established up to 20 percent cover at the community's ecotone with mechanically disturbed areas. Cheatgrass (*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[2]. 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 CDFW as G4S3?, signifying that it is "vulnerable and at moderate risk" (the question mark signifies CDFW uncertainty due to a lack of comprehensive distribution data), and thus would be

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[1] This community is also referred to as big sagebrush scrub and Great Basin mixed scrub in this document.
[2] A *fumarole* is an opening in the earth's crust which emits steam and gases.

considered sensitive by the State of California. The principal threat to this community's continued 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. Cheatgrass, 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 cheatgrass 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).

Douglas' Sedge Meadow/Creeping Rye Grass Meadow

These wetland plant communities are found within and adjacent to the stream channel flowing through the existing Casa Diablo complex within a relatively densely vegetated 10-30 foot wide corridor occupying the central channel and the first flood plain terrace. They are dominated by Douglas' sedge (*Carex douglasii*) and creeping rye grass (*Leymus triticoides*), respectively. Associated species include cheatgrass, Mexican rush (*Juncus mexicanus*), and salt grass (*Distichlis spicata*). These communities are both currently regulated as "special status" vegetation communities by the CDFW.

Thermally Disturbed

Non-native annuals such as cheatgrass, 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 cheatgrass, Russian thistle, California willowherb (*Epilobium foliosum*), yellow salsify (*Tragopogon dubius*), and common knotweed (*Polygonum aviculare* ssp. *depressum*). Gravel-capped 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 through revegetation methods implemented following construction of the pipelines. Pipeline corridors constructed in the early 1990s are now largely indistinguishable from the surrounding vegetation types. Revegetation efforts following facilities development in forest and scrub habitat at Basalt Canyon, Upper Basalt, and Casa Diablo have resulted in successful, relatively rapid restablishment of native plants.

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), USFS, 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 cheatgrass stands are thought to increase the risk and

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.

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 cheatgrass, 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 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[3] 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.

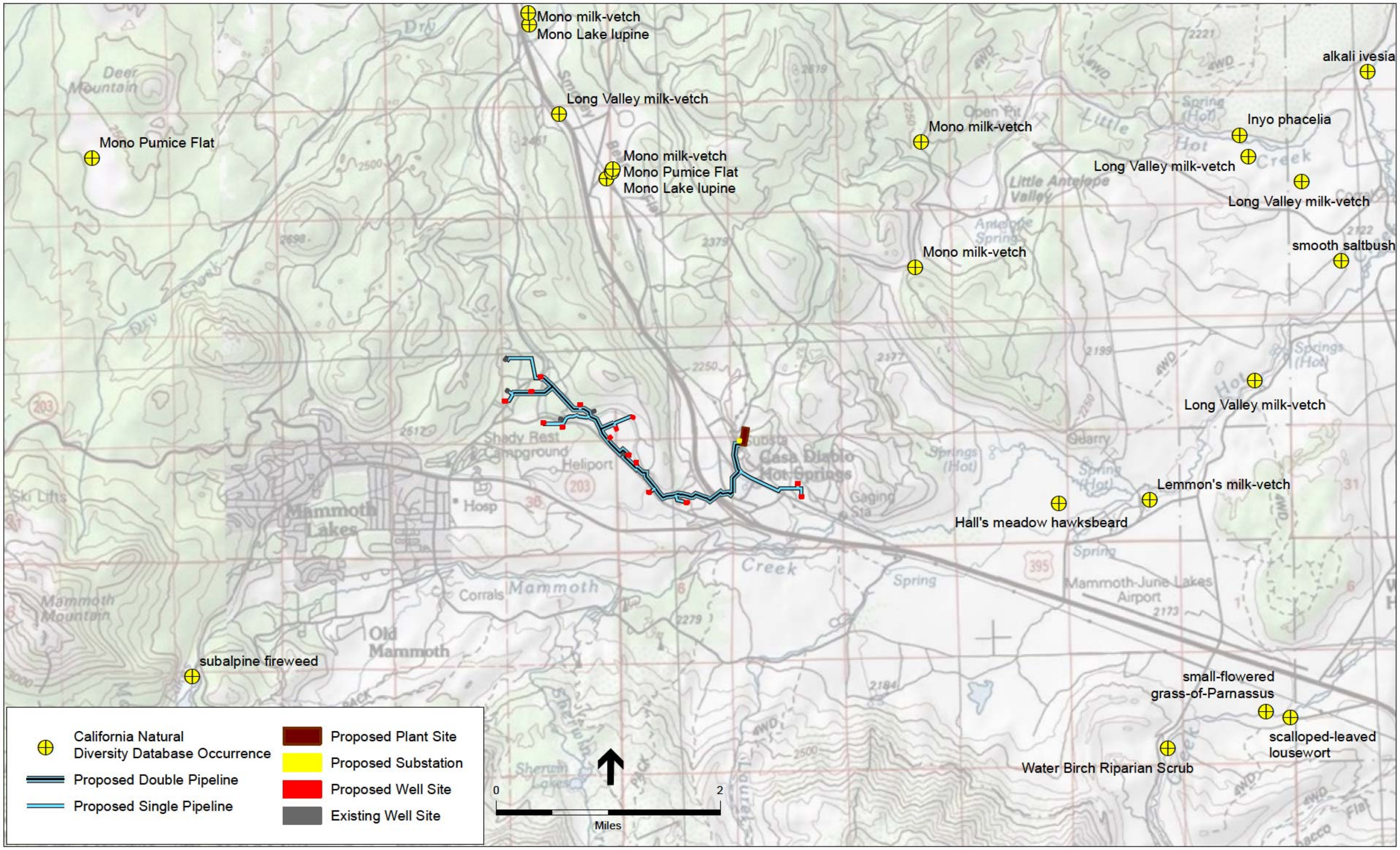
A list of special-status plant species that have the potential to occur within the vicinity of the Project area was compiled based on data in CNDDB [CNDDB, (CDFG, 2012) (Figure 3.3-1)], CNPS Inventory of Rare and Endangered Plants (CNPS, 2012), and the USFWS List of Federal Endangered and Threatened 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; 2012a), 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.

[3] 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; DFG, 2012

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

Figure 3.3-1
Special Status Plants
in the Project Vicinity

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.

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, 2012b). 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

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/1 B.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/1 B.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 PROJECT 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 PROJECT 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 PROJECT 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 PROJECT 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 PROJECT 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: (CDFW)
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; 2012a (again unnamed) entering near Shady Rest Park and near the Casa Diablo fumaroles zone. The USFS has designated corridors of 300 feet in width as Riparian Conservation Areas (RCA) at every USGS “blue line” drainage in the area, including those of the Project area (Paulus, 2012b).

A total of 1.89 acres of potentially jurisdictional wetlands (Douglas’ sedge meadow and creeping ryegrass meadow) were mapped within the Project area, all in close proximity to the existing power plant facilities (see Figure 3.3-3). These potentially jurisdictional wetlands are found within and adjacent to the stream channel flowing through the existing Casa Diablo complex. The “blue line” drainage that through the Casa Diablo Geothermal Lease area shows a clear and continuous ordinary high water mark until its connection to Mammoth Creek. It is therefore likely a jurisdictional water of the U.S. (see Figure 3.3-2). The assessment performed by Paulus (Paulus, 2012b) determined that the “blue line” drainages in Upper Basalt and Basalt Canyon were likely not jurisdictional under the CWA (see Figure 3.3-2). These features are likely “isolated” features due to large gaps in function and physical characteristics. “Blue line” features in Upper Basalt and Basalt Canyon did not exhibit continuous indicators of a defined bed and bank and an ordinary high water mark. No wetland or riparian areas were located along the “blue line” drainages in Upper Basalt or Basalt Canyon. The assessment performed by Paulus (Paulus, 2012b) has not been reviewed by the USACE and should be considered preliminary until official review and verification by the USACE.

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.

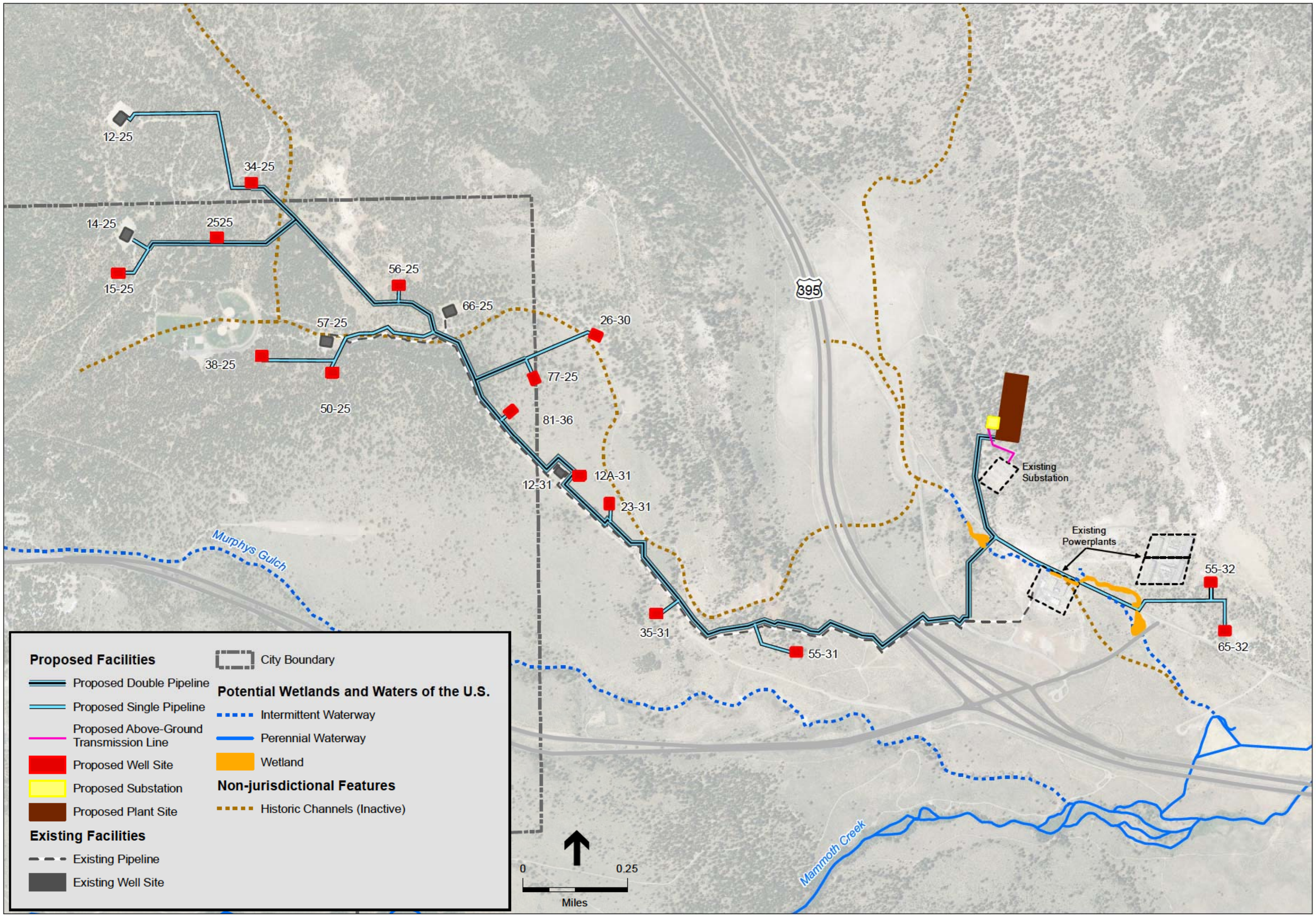
3.3.2 Applicable Regulations, Plans, and Policies/Management Goals

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

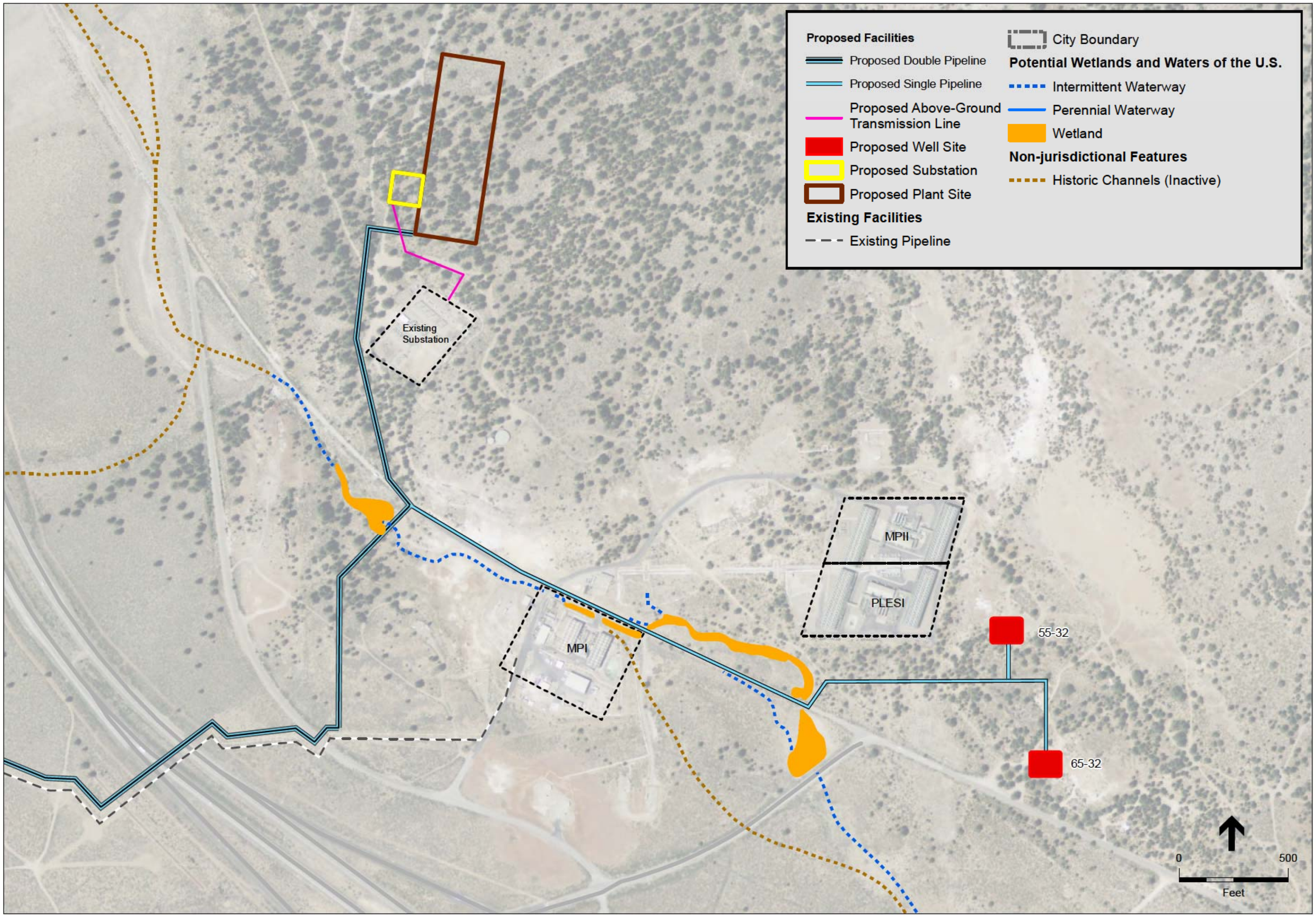
NEPA (42 USC 4321 et seq.) declares a continuing federal policy that directs “a systematic, interdisciplinary approach” to planning and decision-making and requires environmental statements for “major Federal actions significantly affecting the quality of the human environment.” Implementing regulations 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



SOURCE: FEMA, 2010; NHD, 2011; Ormat, 2011

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

Figure 3.3-2
Potential Wetlands and Waters of the U.S.



SOURCE: FEMA, 2010; NHD, 2011; Ormat, 2011

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

Figure 3.3-3
Potential Wetlands and Waters of the U.S.

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 CDFW under the CESA §§2091 and 2081. Section 2091, like FESA §7, provides for consultation between a state lead agency under the CEQA and CDFW, 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 CDFW 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 CDFW, 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. CDFW 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 CDFW to maintain viable populations of all native species. To that end, the CDFW 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 CDFW 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 Wildlife 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 CDFW 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 CDFW. 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 CDFW prior to beginning of the activities listed above. The CDFW 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 CDFW 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 CDFW’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 CDFW 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) (CDFW, 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 CDFW'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, Douglas' sedge/creeping ryegrass meadow, 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.

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.

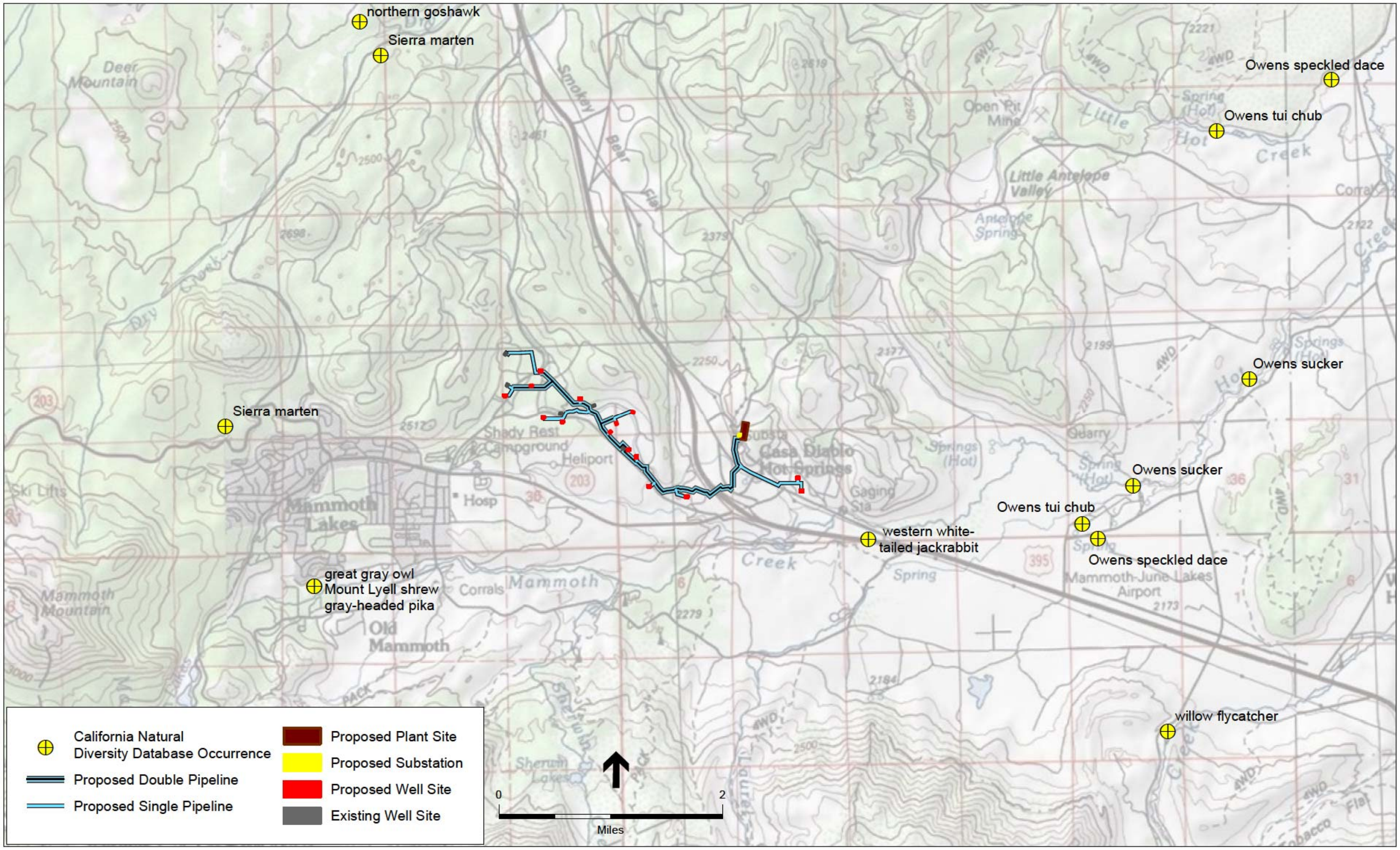
Wildlife species observed in the Project area during surveys include mule deer (*Odocoileus hemionus*), jackrabbits (*Lepus* sp.), cottontail rabbits (*Sylvilagus* sp.), ground squirrels (*Spermophilus* sp.), chipmunks (*Neotamias* sp.), kangaroo rats (*Dipodomys* sp.) and wood rats (*Neotoma* sp.). 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 (CDFW, 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



SOURCE: Ormat, 2011; DFG, 2012

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

Figure 3.4-1
Special Status Animals in the Project Vicinity

(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.

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.	**Medium** – 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	--/BLMS/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.	**Medium** – 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 PROJECT AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in the Project Area
Amphibians			
Anaxyrus canorus Yosemite toad	FPT/FSS/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/BLMS/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 sierrae Sierra Nevada yellow-legged frog	FPE/FSS/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/BLMS/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/BLMS/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	--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.
Buteo swainsoni *Swainson's hawk*	FSS/BLMS/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.

TABLE 3.4-1 (Continued)
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
Birds (cont.)			
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.	Low – The Project area is dominated by Jeffrey pine forest with a patchy sagebrush understory. While the CD-IV Project is within the range of the greater sage-grouse, they generally avoid forested habitats such as those in the Project area.
Coccyzus americanus occidentalis western yellow-billed cuckoo	FC/FSS/BLMS/ 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/BLMS/ 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.	Unlikely – Project area provides poor habitat.
Riparia riparia bank swallow	--/BLMS/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.
Strix occidentalis *California spotted owl*	FSS/MIS/BLMS/ 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.

TABLE 3.4-1 (Continued)
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
Birds (cont.)			
Toxostoma lecontei Le Conte's thrasher	--/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/BLMS/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/FSS/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.
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.

TABLE 3.4-1 (Continued)
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
Mammals (cont.)			
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 denning habitat.
Martes pennanti (pacifica) DPS Pacific Fisher	FC/BLMS/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	--/BLMS/--	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.
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.**

TABLE 3.4-1 (Continued)
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
Mammals (cont.)			
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
- FPE = Federally Proposed Endangered
- FPT = Federally Proposed Threatened
- BLM S= BLM Sensitive
- FSS = Forest Service Sensitive
- MIS = Forest Service Management Indicator Species
- SSI = Forest Service Species of Special Interest

State: (CDFW)
- 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; CDFW, 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 introgressed Owens tui chub and Lahontan tui chub. Isolation is necessary to prevent interbreeding and hybridization of the Owens tui chub with another subspecies, the Lahontan tui chub (Chen and May, 2003) and the introgressed Owens tui chub. Additionally, Owens tui chub prefer habitat that is free from predatory fish such as largemouth bass and brown trout. However, they have been known to coexist with these species.

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 in 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 BLM Sensitive species and is Fully Protected by CDFW.

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: Golden eagles are considered unlikely in the Project site because habitat is not appropriate for this species. Based on a CNDDB records search and local knowledge, golden eagles occur year round in the eastern Sierra. Golden eagles have been observed soaring in the Crowley Basin, near the Glass Mountains, over 10 miles from the Project site. Additionally, a golden eagle has been observed at the Hot Creek Hatchery, approximately 2 miles from the Project site. The nearest occurrence documented in CNDDB is approximately 30 miles southeast of the Project site near Fish Slough north of Bishop. Golden eagles are known to winter along the Owens River and are documented regularly on winter eagle surveys coordinated by CDFW.

There are no documented nests within 10 miles of the Project site. However, golden eagles are likely to nest in the eastern Sierra, outside the Project area, as they have been observed in the eastern Sierra year round. Nesting golden eagles are not known to occur in or near the Project site as there is no suitable nesting habitat. The secondary growth Jeffery pine forest in the Project site does not provide nesting opportunities, as this species prefers to nest on cliffs or rocky escarpments.

Golden eagles are not expected to use the Project site for foraging because the sagebrush openings found in the Project site are small and surrounded by dense Jeffrey Pine forest. It is unlikely that these areas would be used for foraging as this species tends to avoid dense forests. While it is unlikely that a golden eagle soaring over the Project site would attempt to forage in these pockets, if they did, any transmission lines built in relation to the CD-IV Project would be built to follow Avian Power Line Interaction Committee (APLIC) guidelines, thereby minimizing any potential for take as described in Section 3.4.2.1. Because golden eagles are not expected to occur in the Project site and the CD-IV Project will follow APLIC guidelines for transmission lines, the Project is not anticipated to have the potential to impact golden eagles or their habitat.

Northern Goshawk (Accipiter gentilis)

Status: The northern goshawk is a California Species of Special Concern, USFS Sensitive species, and BLM 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 15-25, 25-25 and 34-25 are within a northern goshawk PAC, while proposed well site 77-25 is approximately 0.5 miles from the PAC. Existing well sites 12-25 and 57-25 are located approximately 40 feet and 170 feet, respectively, from 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 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 Population Management Unit (PMU) of the Bi-State DPS area, as delineated in the Bi-State Sage-Grouse DPS Action Plan (Bi-State TAC, 2012a).

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). 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). Though sage-grouse habitat was mapped in the regional Project area in the 2012 Bi-State Greater Sage-grouse Preliminary Priority Habitat Map, the gross-scale mapping effort included forested habitats, which do not support sage-grouse activity (Bi-State Sage-Grouse Technical Advisory Committee, 2012b; Schroeder et al., 2004).

Status in Project Site: Though they are present in the regional area, the Jeffrey pine forest habitat in the Project area precludes the presence of sage-grouse. Sage-grouse habitat is typified by plant species that are found growing beneath Jeffrey pines in the Project area, such as sagebrush, bitterbrush and perennial grasses. However, the mere presence of these species does not necessarily correlate with habitat suitability. Sage-grouse actively select against forested habitat and sagebrush habitat adjacent to forested lands, possibly because trees provide perching substrate for raptors that prey on sage-grouse (Walker, 2010). A sage-grouse was documented in 1986 approximately 0.50 miles from the southernmost CD-IV Project element, west of U.S. Highway 395. Even though sage-grouse have been observed approximately 0.25 miles from the CD-IV Project site's southern edge, the presence of interspersed Jeffrey pines and the lack of herbaceous cover makes the Project area unsuitable based on the current understanding of habitat use and avoidance by this species.

Bald eagle (Haliaeetus leucocephalus)

Status: On June 28, 2007 the bald eagle was removed from the Federal list of threatened and endangered species. The final rule delisting the bald eagle was published on July 9, 2007 and became effective on August 8, 2007. After delisting, bald eagles continue to be protected under the Bald and Golden Eagle Protection Act (BGEPA). Bald eagles are listed as Endangered under CESA and are also a California USFS Sensitive species and a BLM Sensitive species.

Distribution: The bald eagle breeding range in the west extends along the Pacific coast from southern Alaska through the Pacific Northwest to Northern California. A few small populations live in Arizona and Colorado. Within California, bald eagles are permanent residents in the north and uncommon winter migrants, particularly in the south. Northern California has a large breeding population and approximately half of the winter population is found in the Klamath Basin along the Oregon border. In the Sierra Nevada, it is estimated that between 100 to 300 bald eagles winter on Sierra Nevada Forests and at least 151-180 pairs remain year-round.

Habitat and Biology: The bald eagle is found breeding in a variety of habitats throughout California. Hardwoods and conifers make up the majority of nest trees and are always associated with large bodies of water that support fish, waterfowl and other water birds in abundance. The bald eagle spends the winter months near large waterbodies and waterways where waterfowl, fish, and other waterbirds are abundant. Large trees or snags are a required winter habitat component for perching, roosting and hunting. The bald eagle often roosts communally during the winter. Breeding generally occurs February to July, but nesting can be initiated as early as January at lower elevations. Incubation may begin in late February to mid-March, with the nesting period extending to the end of June. From June through August, fledglings are restricted to the nest until they are able to move around within their environment. In California, trees selected for nesting are characteristically one of the largest in the stand with tree heights usually over 100 feet tall. The majority of bald eagle nests occur within one mile of water and almost always have an unobstructed view of a waterbody.

Status in Project Site: Bald eagles are considered unlikely in the Project site because habitat is not suitable for this species. Based on CNDDB records and local knowledge, bald eagles occur year-round in the eastern Sierra. The nearest documented occurrence of bald eagle in the CNDDB is approximately 18 miles south of the Project site on Lake Edison (CDFW, 2012). Local biologists have also observed bald eagles foraging at large bodies of water closer to the Project site. This includes Hot Creek and Laurel Ponds, both approximately 2 miles from the Project site, as well as Crowley Lake and the Owens River, both over 4 miles away from the Project site. A nesting pair was known to exist approximately seven miles from the Project site along the upper Owen's River. The pair produced young for approximately 3 to 4 years until recently (2 to 3 years ago). Only one bald eagle frequents the nest site now (AMEC E&I, Inc., 2012). Bald eagles are known to winter in the eastern Sierra, as documented in winter eagle surveys coordinated by CDFW. They winter along the Owens River and near large bodies of water in the eastern Sierra.

While bald eagles have been observed approximately 2 miles from the Project site, they have not been documented in and are not expected to occur at the Project site. This is because there are no large bodies of water in or near the Project site to provide suitable foraging habitat. As roosting and nesting typically occurs near foraging habitat and there is no foraging habitat, bald eagles are not expected to roost or nest in or near the Project site. Therefore, the CD-IV Project is not anticipated to have the potential to impact bald eagles or their habitat.

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, BLM Sensitive species, and 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 CDFW.

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 (CDFW, 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. In 1987, an individual was described near McGee Mountain in Inyo National Forest, approximately 5.9 miles south of the Project area. Another individual was described in 1988, near Deadman Creek, approximately 5.6 miles north of the Project area.

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; however, the nearest described sightings are more than 5 miles from the Project area.

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 CDFW 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 CDFW, 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 CDFW 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 CDFW, 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 CDFW 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 CDFW to maintain viable populations of all native species. To that end, the CDFW 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

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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.

[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 CDFW 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 CD-IV 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 and INF are 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 April 2010, and will continue to work on consultation efforts along with the BLM 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. Section 6 details the consultation efforts.

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 CD-IV 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

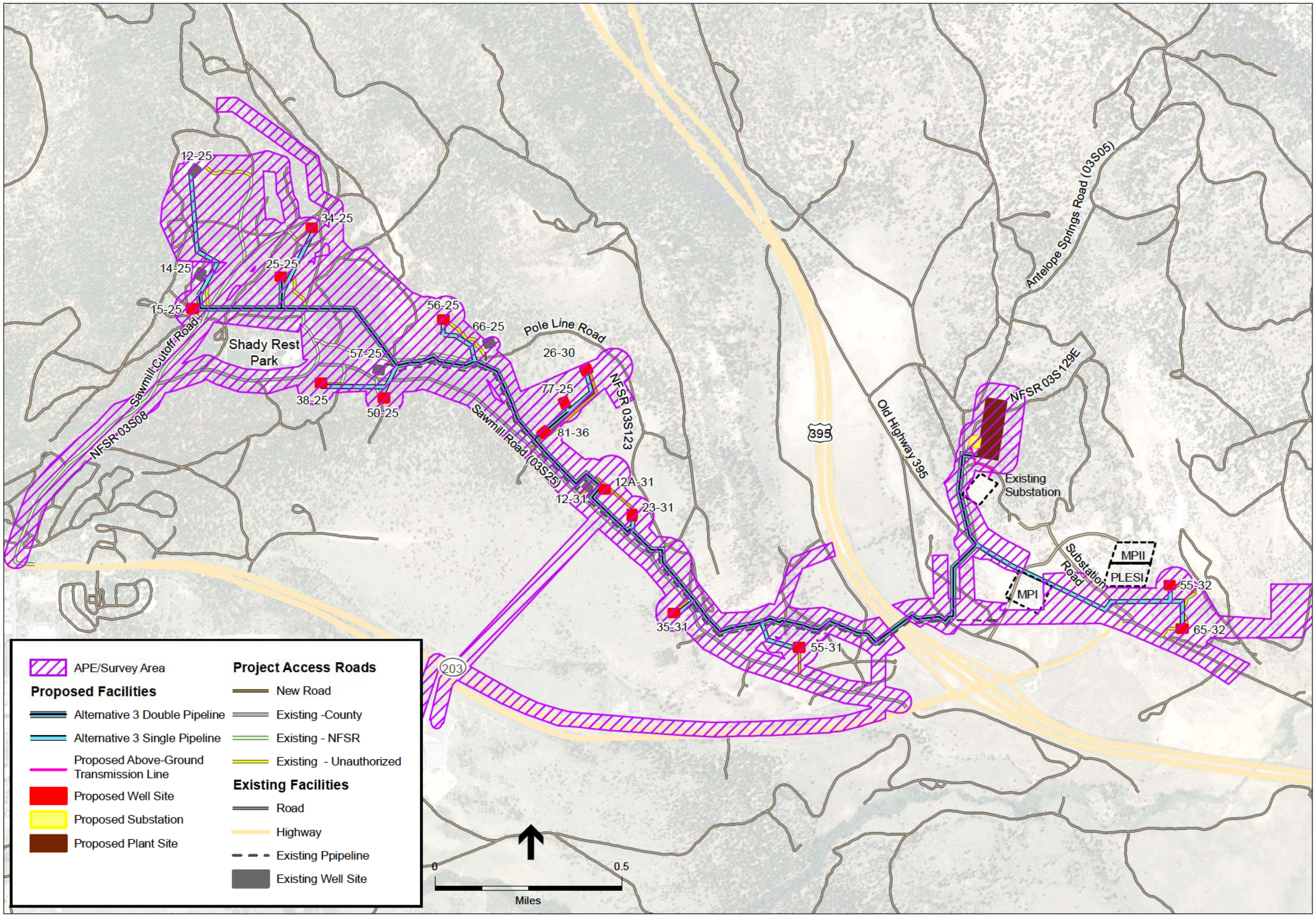
The BLM has drawn the Area of Potential Effects (APE), as illustrated in Figure 3.6-1, to include an area sufficient to accommodate Alternative 3 components. The BLM has determined that the undertaking may adversely affect properties eligible for listing in the National Register, and is consulting with 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, 2010

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.

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 CD-IV 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 CD-IV 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 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 *Technical Geologic Overview of Long Valley Caldera for the Casa Diablo IV Geothermal Development Project* (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.

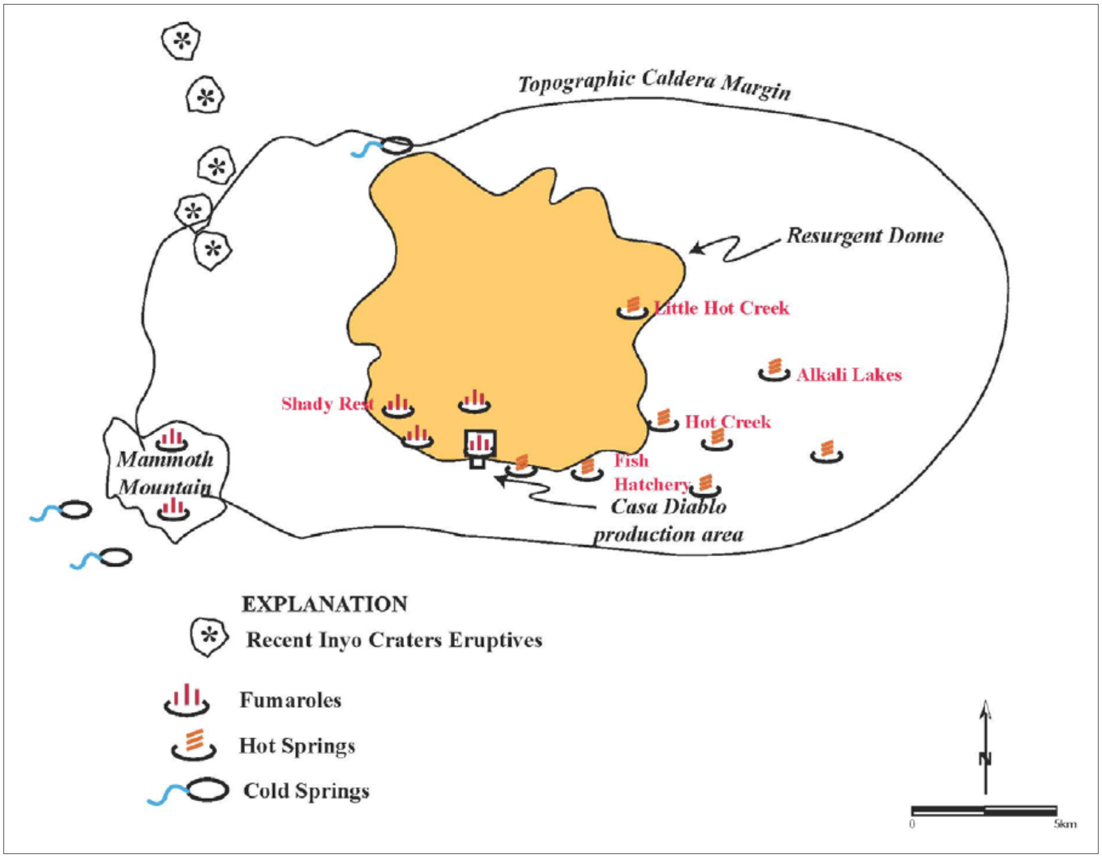
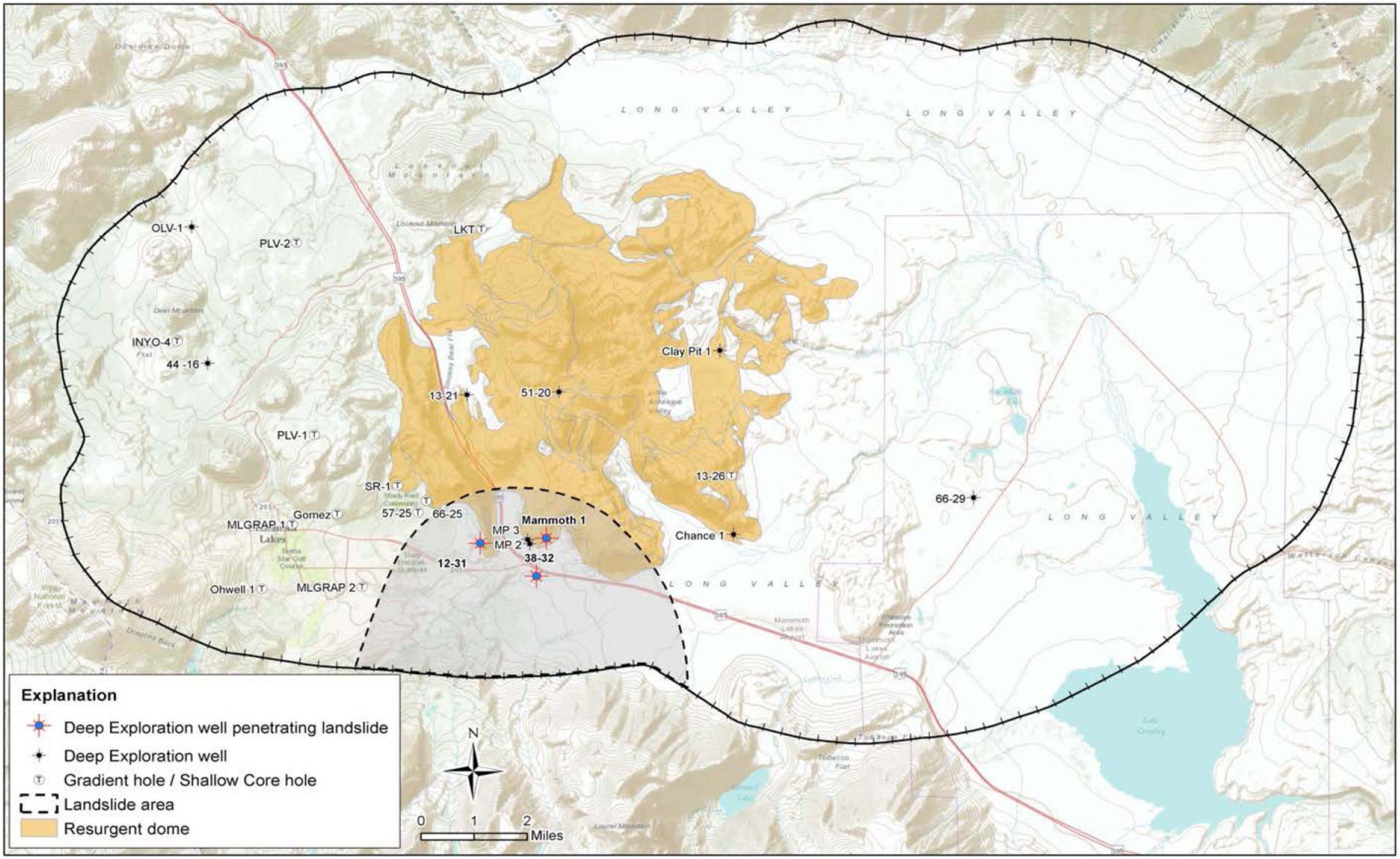


Figure reproduced from Suemnicht (2010)

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).

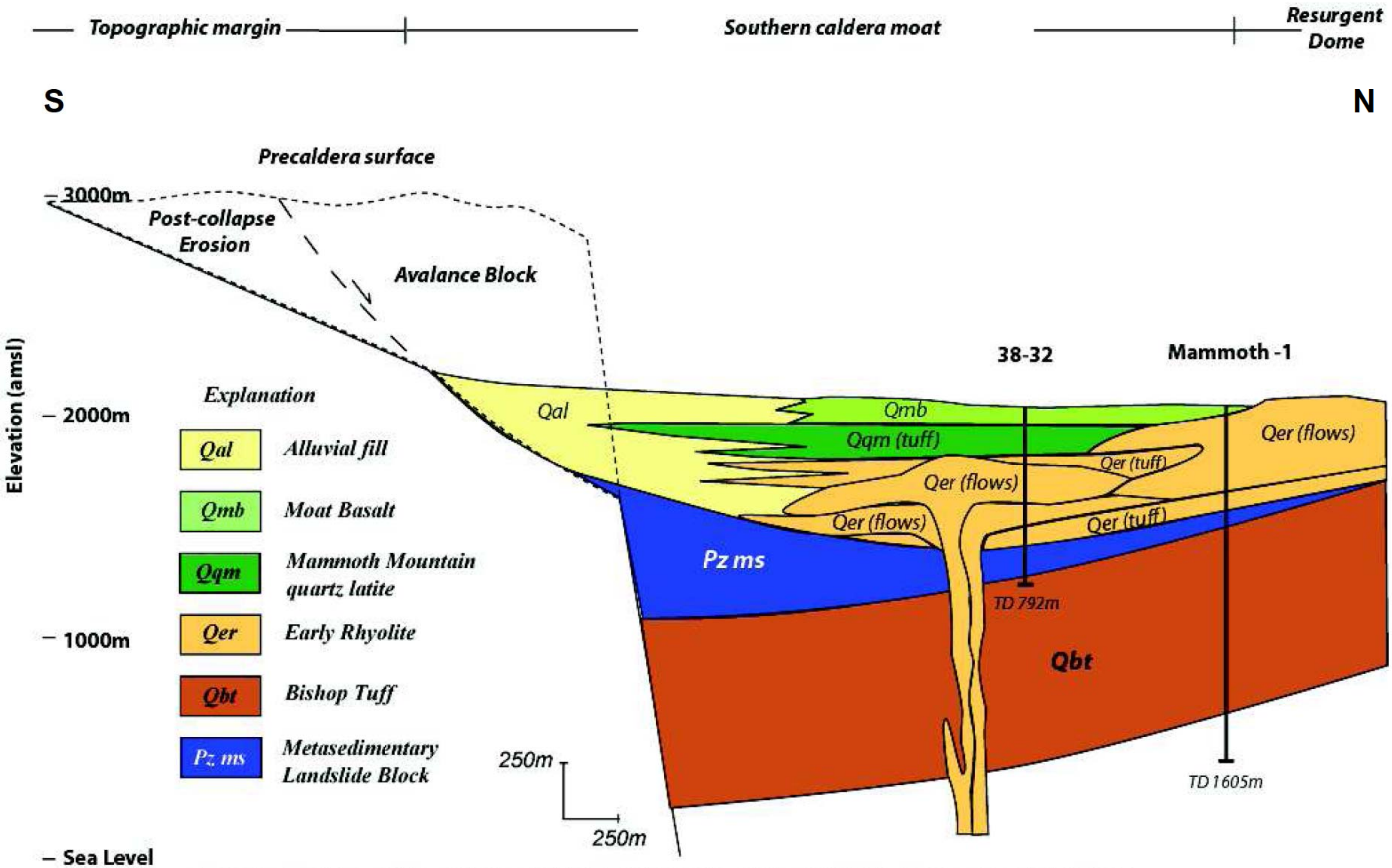
Existing geothermal wells at Casa Diablo produce moderate temperature fluids from a comparatively shallow section of fractured Early Rhyolite, which represents the outflow of the geothermal system. Drilling results and monitoring records indicate the shallow Early Rhyolite reservoir at Casa Diablo and 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

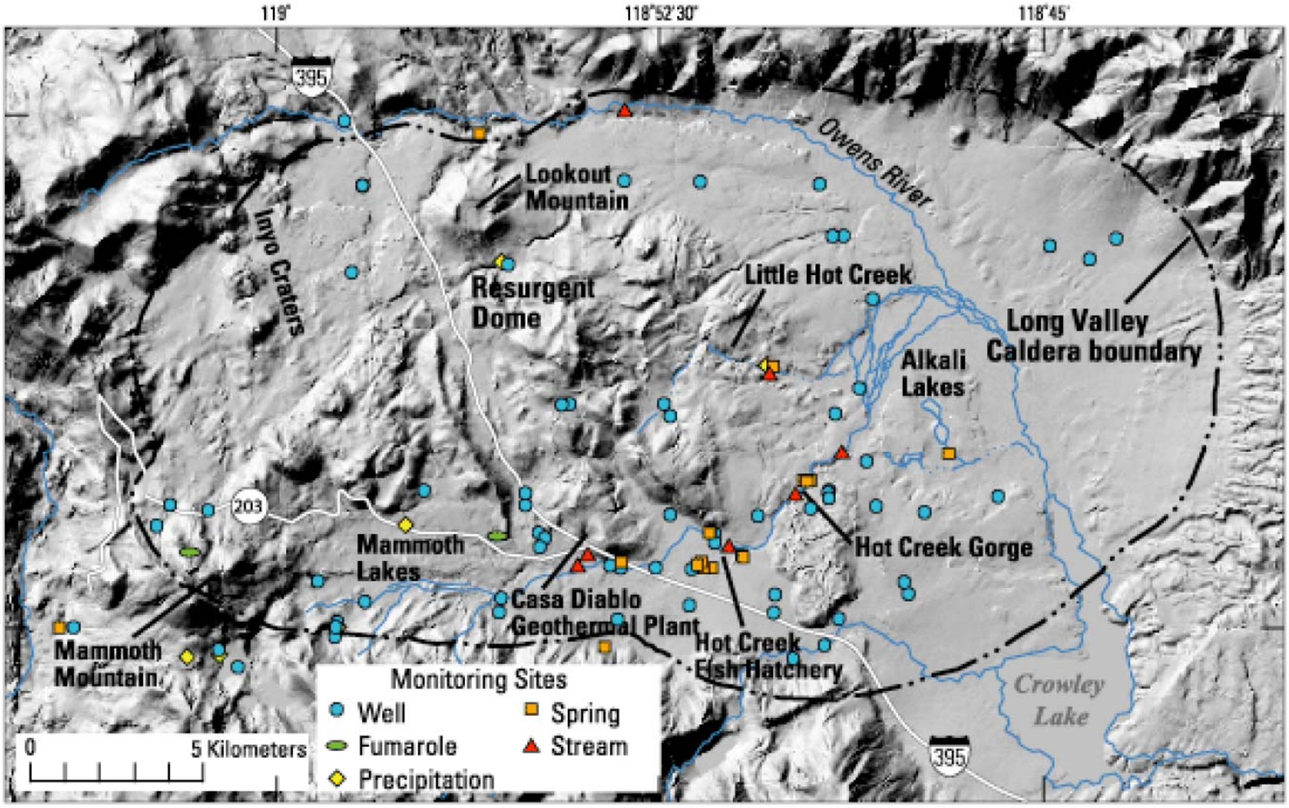
declines along the structural caldera margins. This shallow geothermal zone is separated from shallower cold groundwater aquifers in the unconformably overlying sediments to the west in Basalt Canyon by altered sections of the upper Early Rhyolite. These sections of the upper Early Rhyolite have been 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.

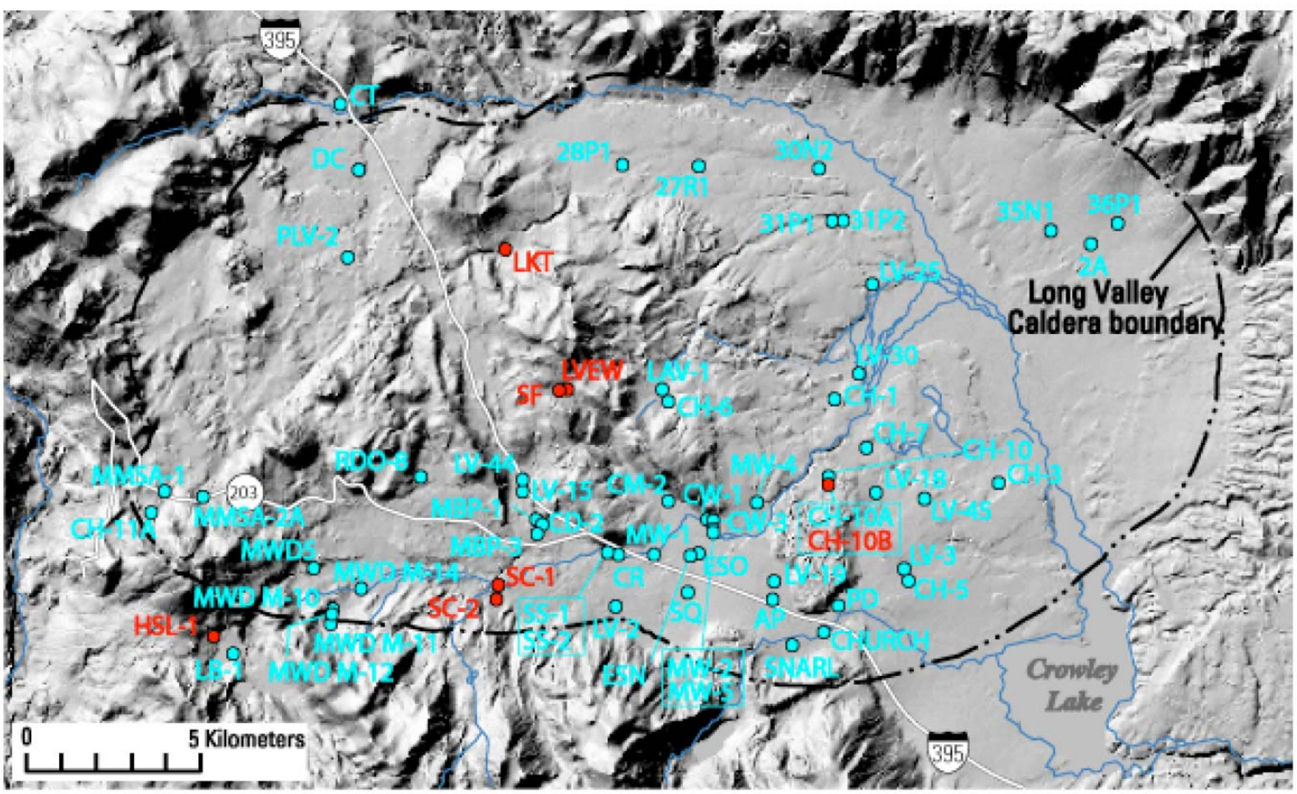
Basalt Canyon wells, approximately 1.2 miles (2 km) west of Casa Diablo, produce from fractured geothermal reservoir within the lower section of Early Rhyolite and the upper section of Bishop Tuff. The reservoir at Basalt Canyon is deeper and closer to the upflow of the system than the Early Rhyolite 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 CD-IV 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, G*eology, 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 Wildlife 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 ^{o}F (200^{o}C to 280 ^{o}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 ^{o}F or 158^{o}C), and the same or slightly higher than and that the geothermal upflow in the west moat (represented by Monitoring Well 44-16 (392 ^{o}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).

---

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

[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.

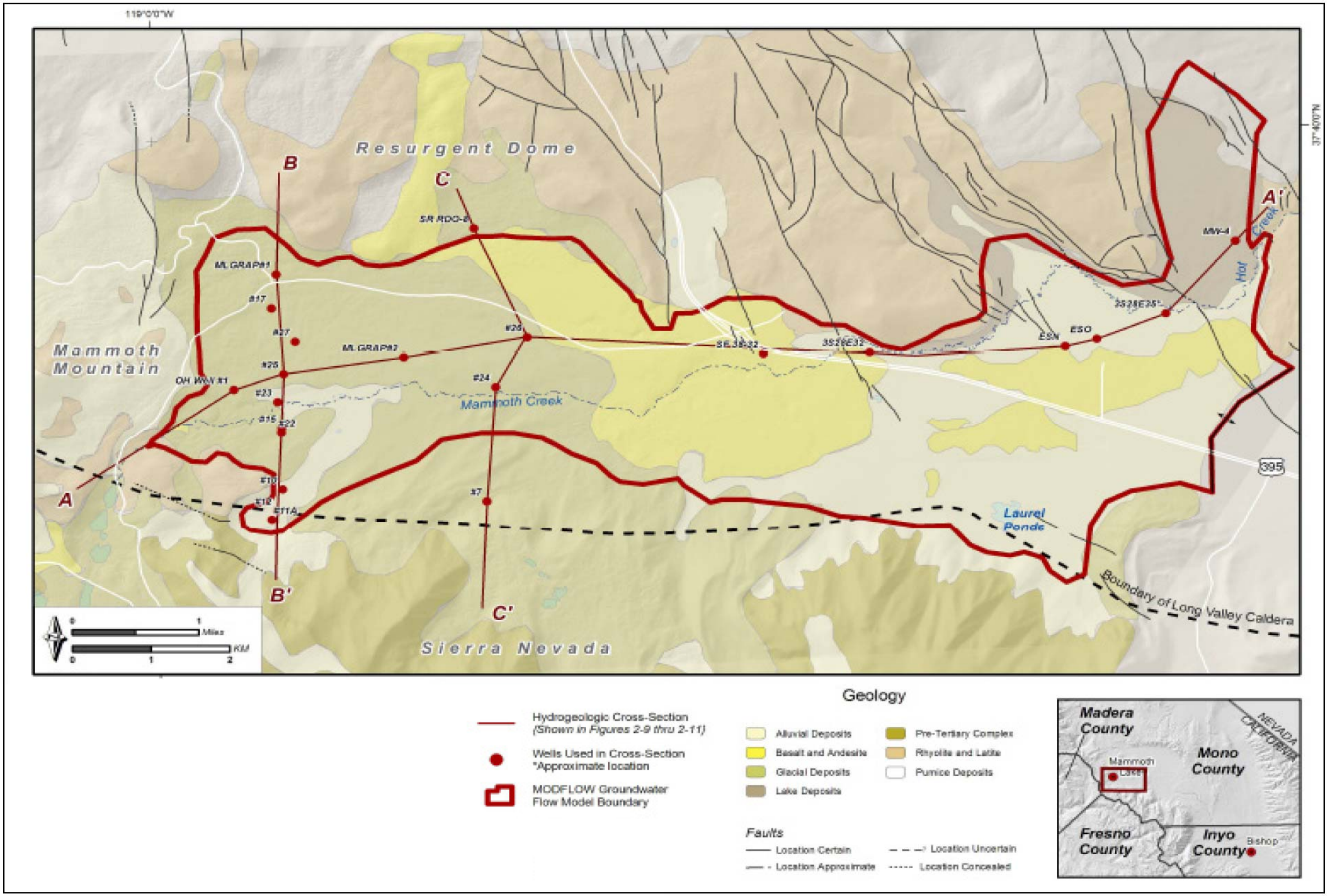
The chemistry of the thermal features collected as part of the LVHAC hydrologic monitoring suggest that the thermal features, such as Hot Creek Spring and Hot Bubbling Pool, are predominantly thermal water with mixtures of groundwater. Combining chloride and temperature data and assuming that the thermal 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 indicative of the mixing of shallow cold groundwater and deeper geothermal fluids 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'

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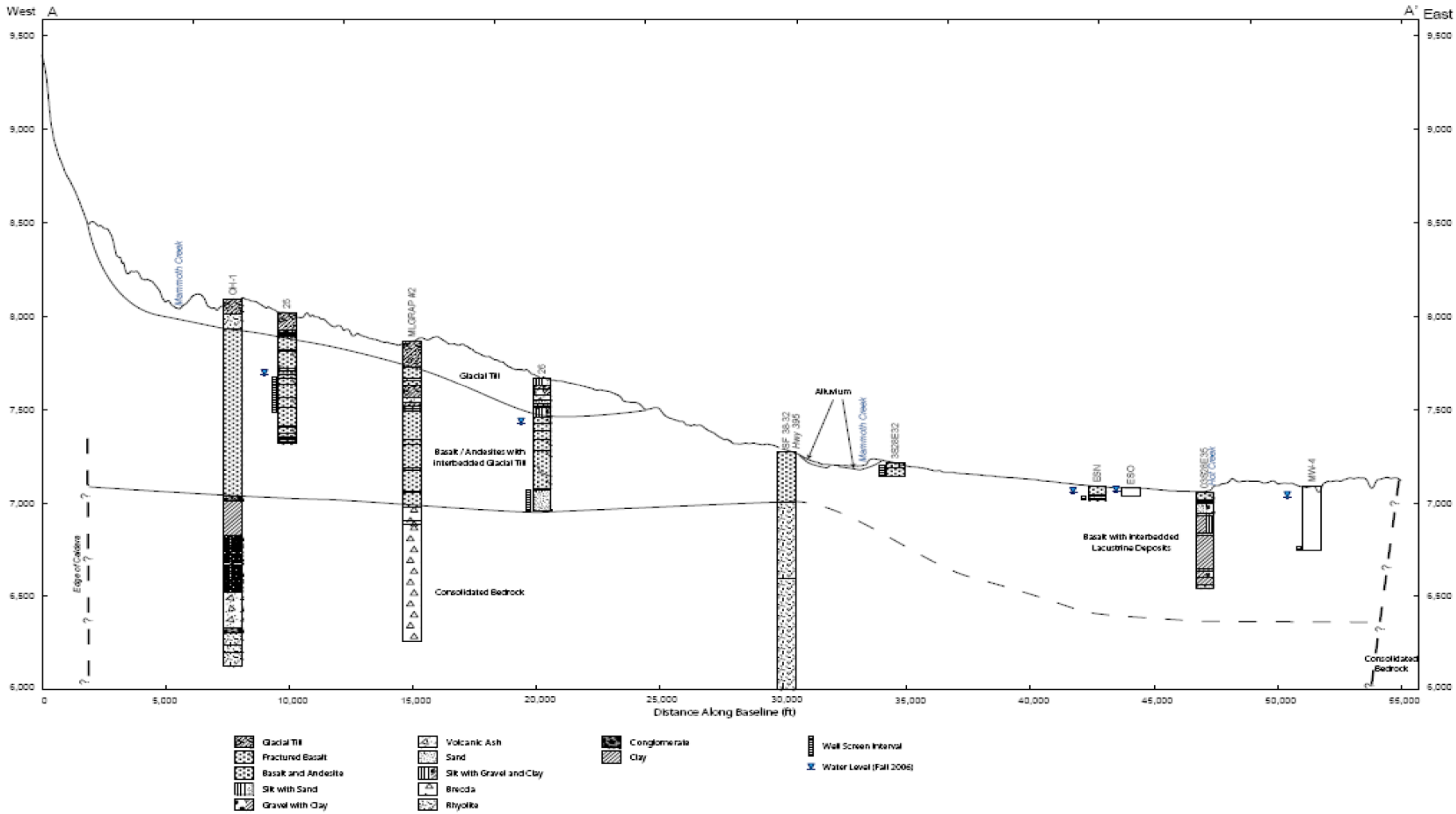
Figure 3.7-5
Mammoth Groundwater Basin



SOURCE: Wildermuth (2009)

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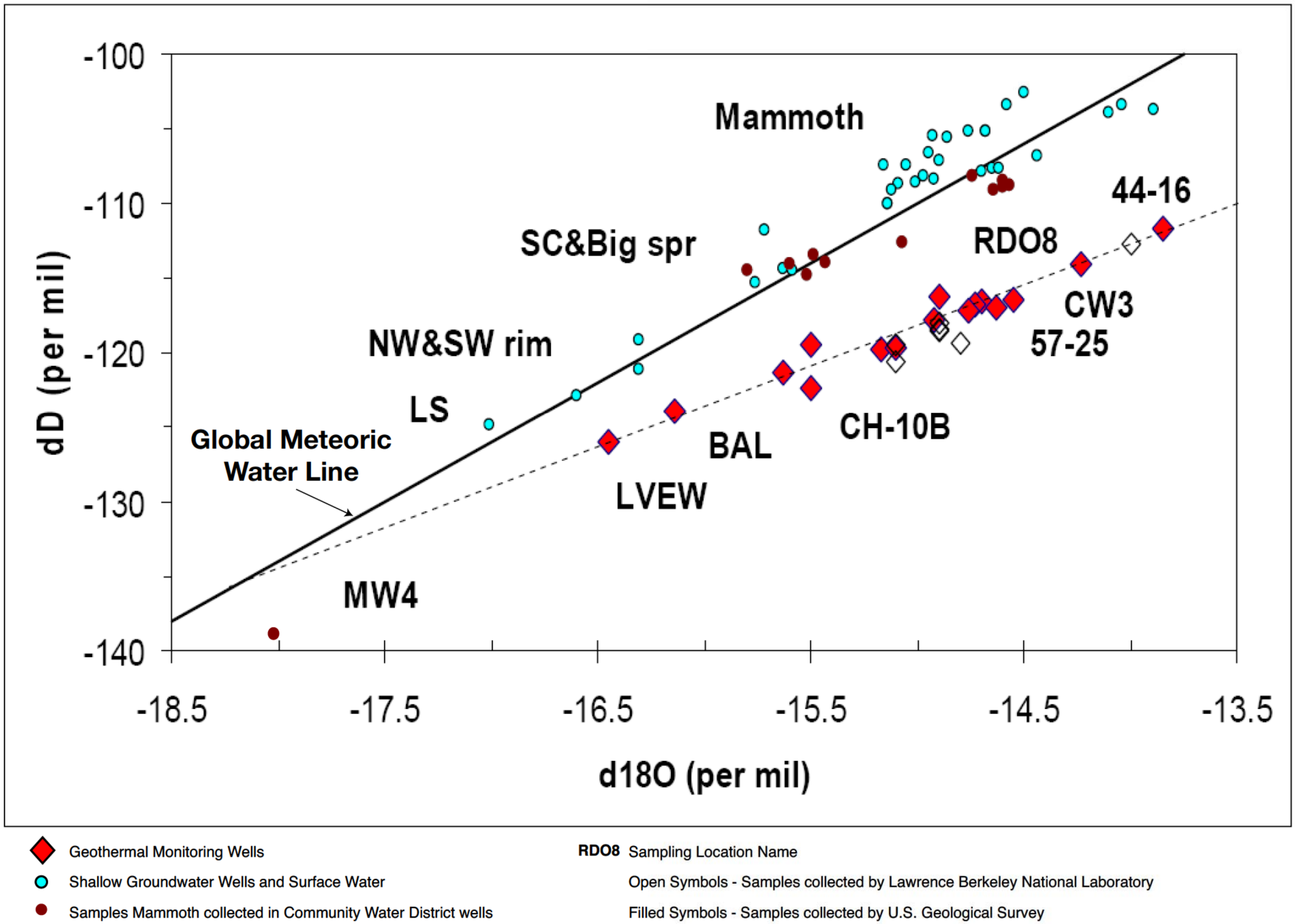
Figure 3.7-6
Mammoth Groundwater Basin geologic Cross-section.
The groundwater aquifer is hosted by glacial till interbedded with basalt/andesite.



SOURCE: EGS, 2012

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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 CD-IV 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 Wildlife, 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

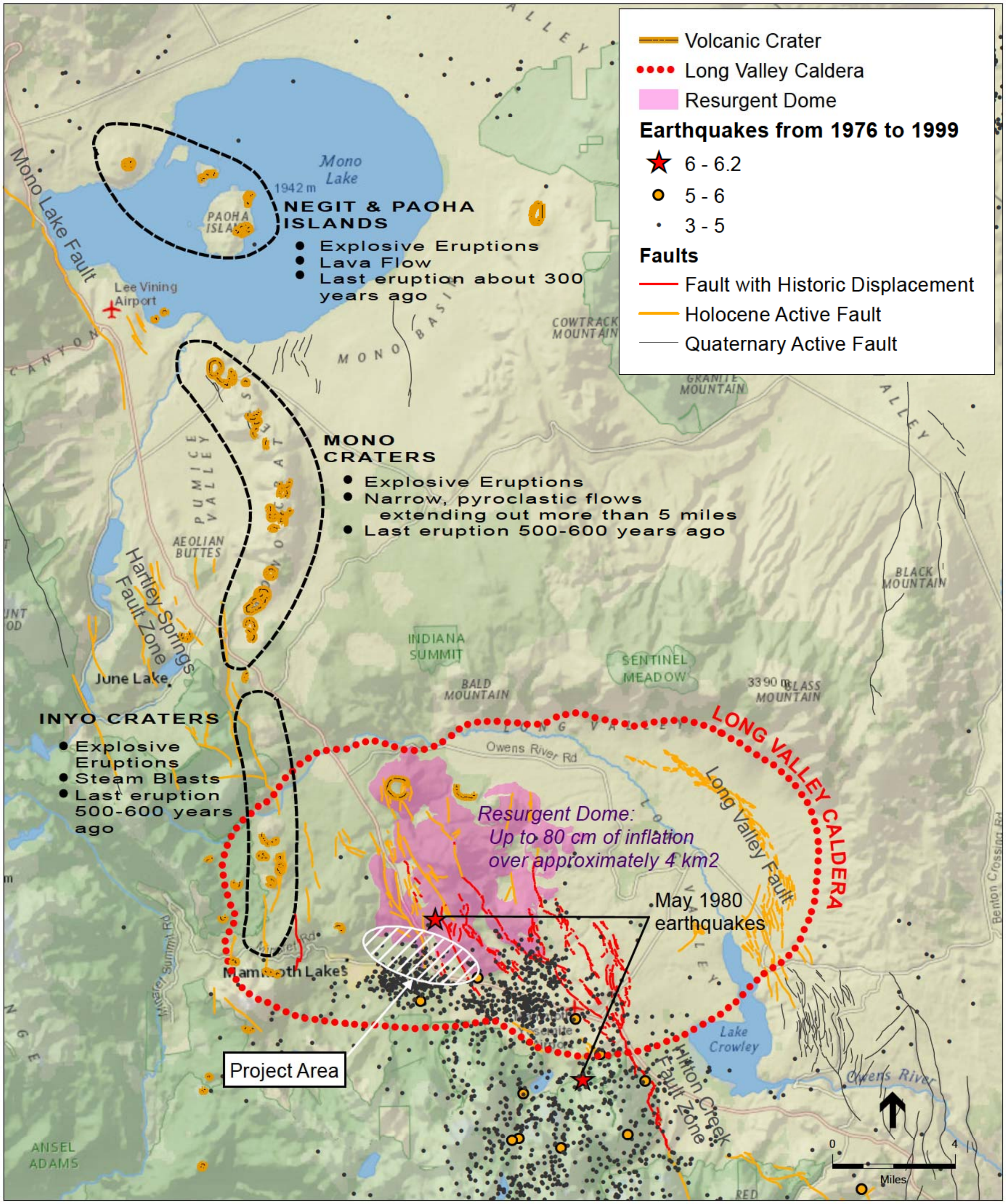
3.8.1 Environmental Setting

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

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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.

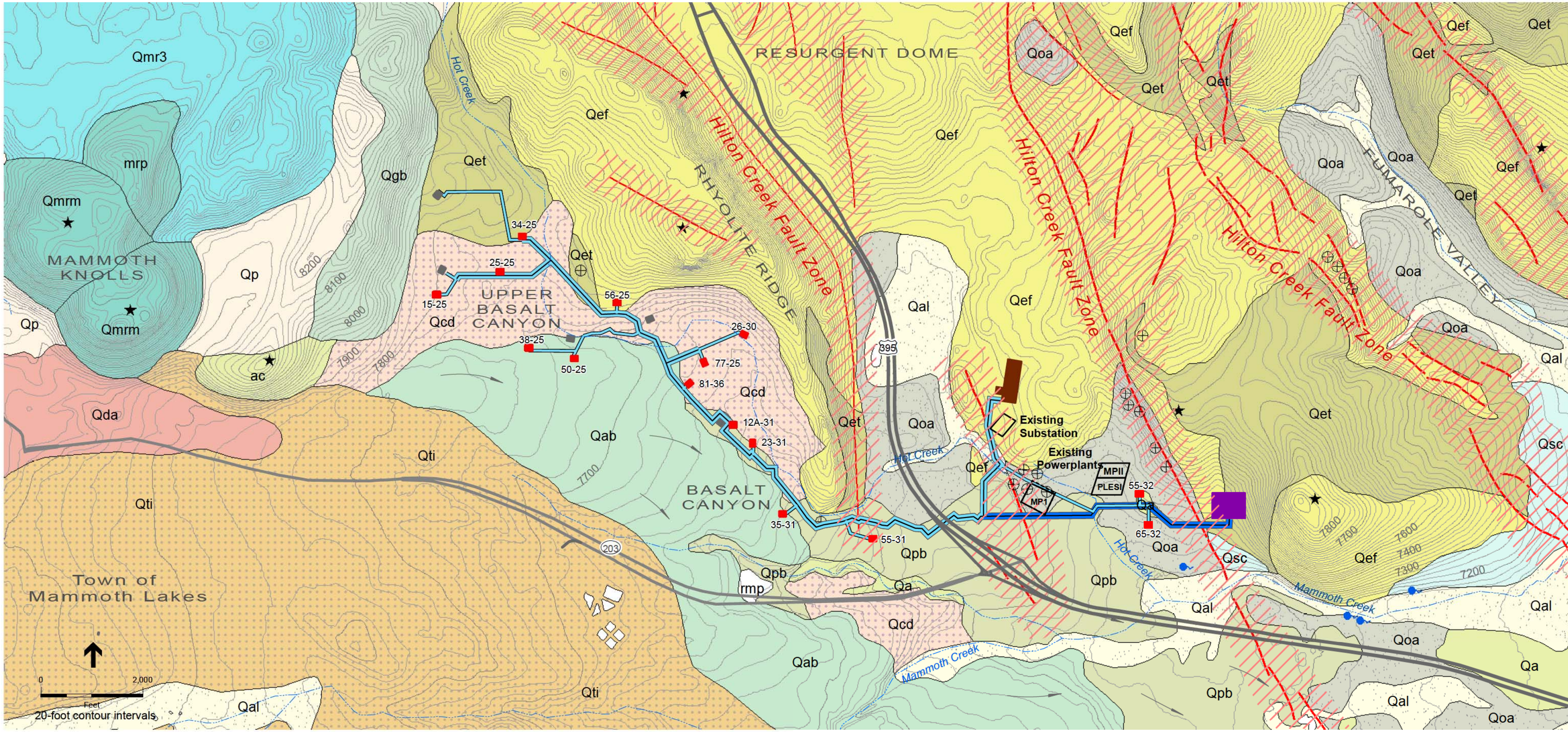
4. **Rhyolitic volcanic rocks (*Qmrm, Qmr3, Qef, Qet*):** These volcanic rocks are generally divided between those produced during an early succession of explosive eruptions 600 to 700 thousand years ago (i.e., "early" rhyolites), and a later succession of eruptions 100 to 500 thousand years ago (i.e., "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 CD-IV 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.

[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.



Project Features
- Existing Well Site
- Proposed Plant Site
- Proposed Well Site
- Alternative 2 Plant Site
- Proposed Pipeline
- Alternative 2 Pipeline

Sedimentary Rocks
- Qal, Younger Alluvium (Holocene)
- Qoa, Quaternary Alluvium (Pleistocene)
- Qda, Debris Avalance Deposits
- Qcd, Casa Diablo Till (Pleistocene)
- Qti, Tioga Glacial Till (Pleistocene)
- Qsc, Sandstone and Conglomerate

Volcanic Rocks (Rhyolitic)

"Moat" Rhyolites (Pleistocene)
- Qmrm, Rhyolite of Mammoth Knolls
- Qmr3, Rhyolite of Hot Creek

"Early" Rhyolites (Pleistocene)
- Qef, Volcanic Flows and Domes
- Qet, Volcanic Tuff

Volcanic Rocks (Basaltic/Other)
- *Former Lava Flow Direction*
- Qab, Aphyric Basalt (Pleistocene)
- Qpb, Porphyritic Basalt (Pleistocene)
- Qa, ac; Andesite (Pleistocene)
- Qgb, Glomerporphyritic Basalt (Pleistocene)

Active Faults
- Fault with Historic Displacement
- Fault with Holocene Displacement
- Alquist-Priolo Earthquake Fault Zones

Geologic Features
- Fumarole
- Volcanic Vent
- Thermal Spring

SOURCE: Ormat, 2010; Battaglia et al., 2003

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Figure 3.8-2
Geologic Units, Faults and Features

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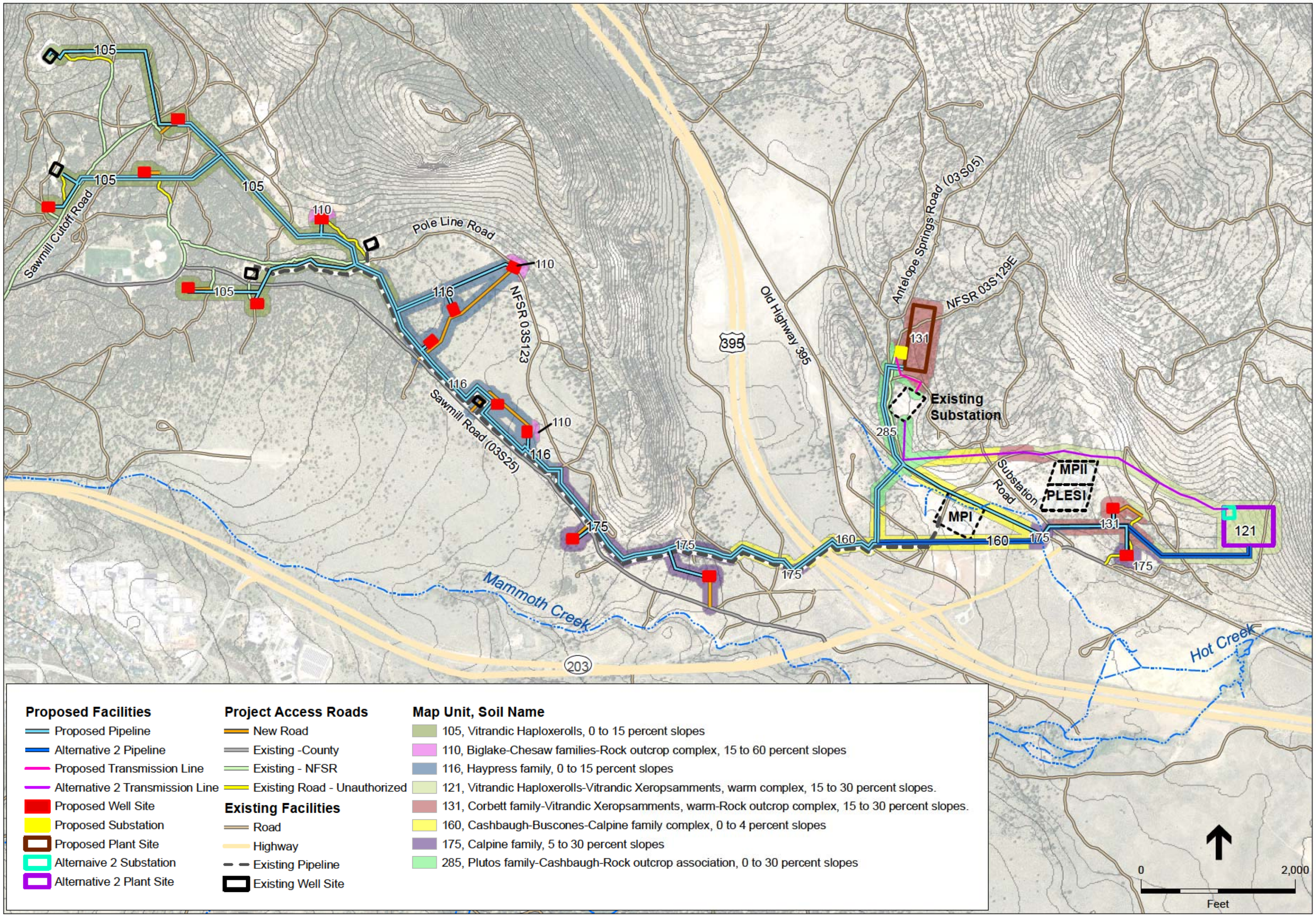

SOURCE: Ormat, 2010; NRCS, 2012

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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 CD-IV 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,

[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 CD-IV 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 Proposed 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 CD-IV 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 CD-IV 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 CD-IV Project. Because the CD-IV 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 CD-IV 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

[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 CD-IV 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

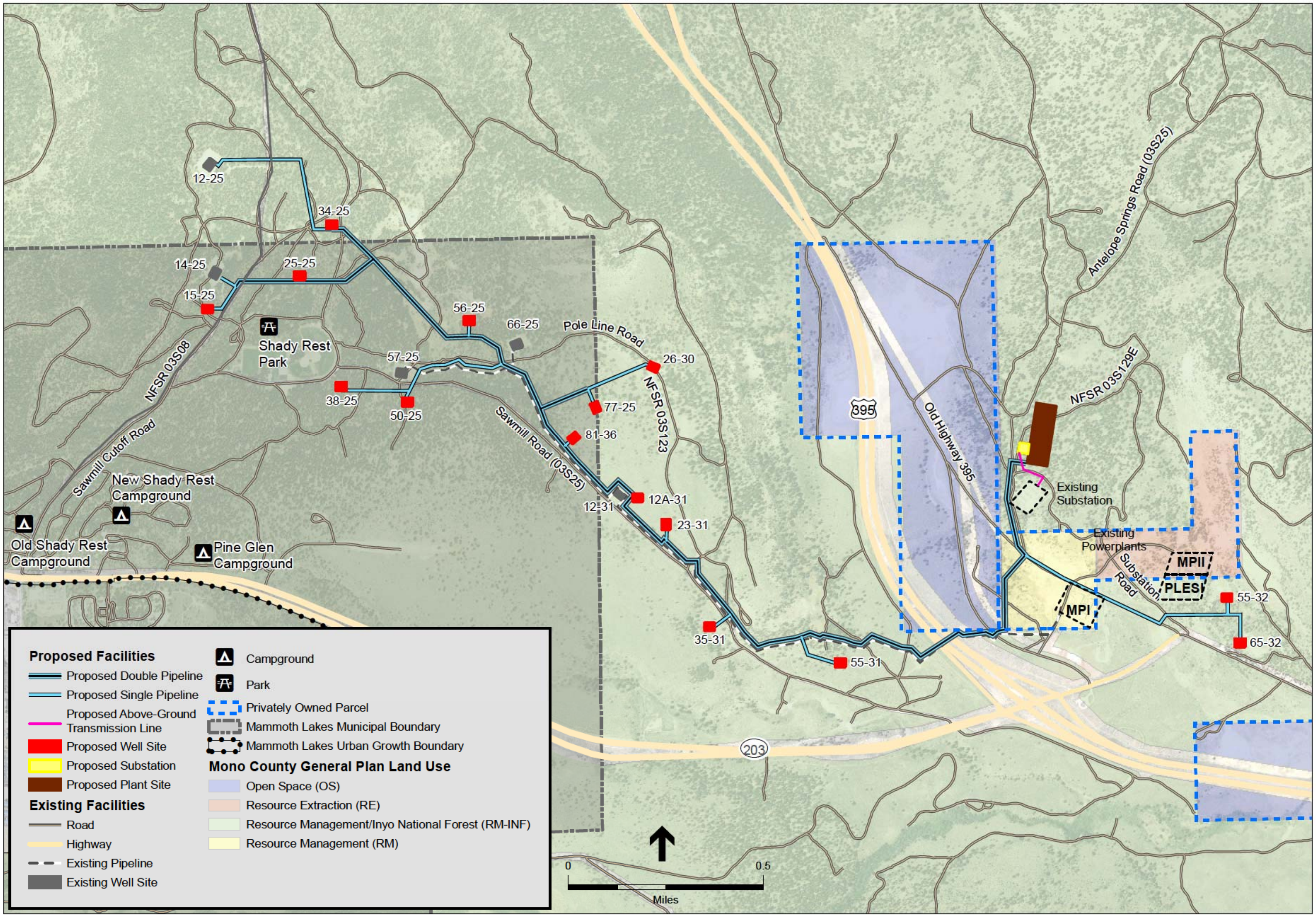
The Mono County General Plan provides policies which apply to private lands in unincorporated areas of the County. The following policies would be applicable to portions of the Proposed Action and Alternatives located on private land (Mono County, 2010a, 2010b):

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; Mono County, 2012

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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).

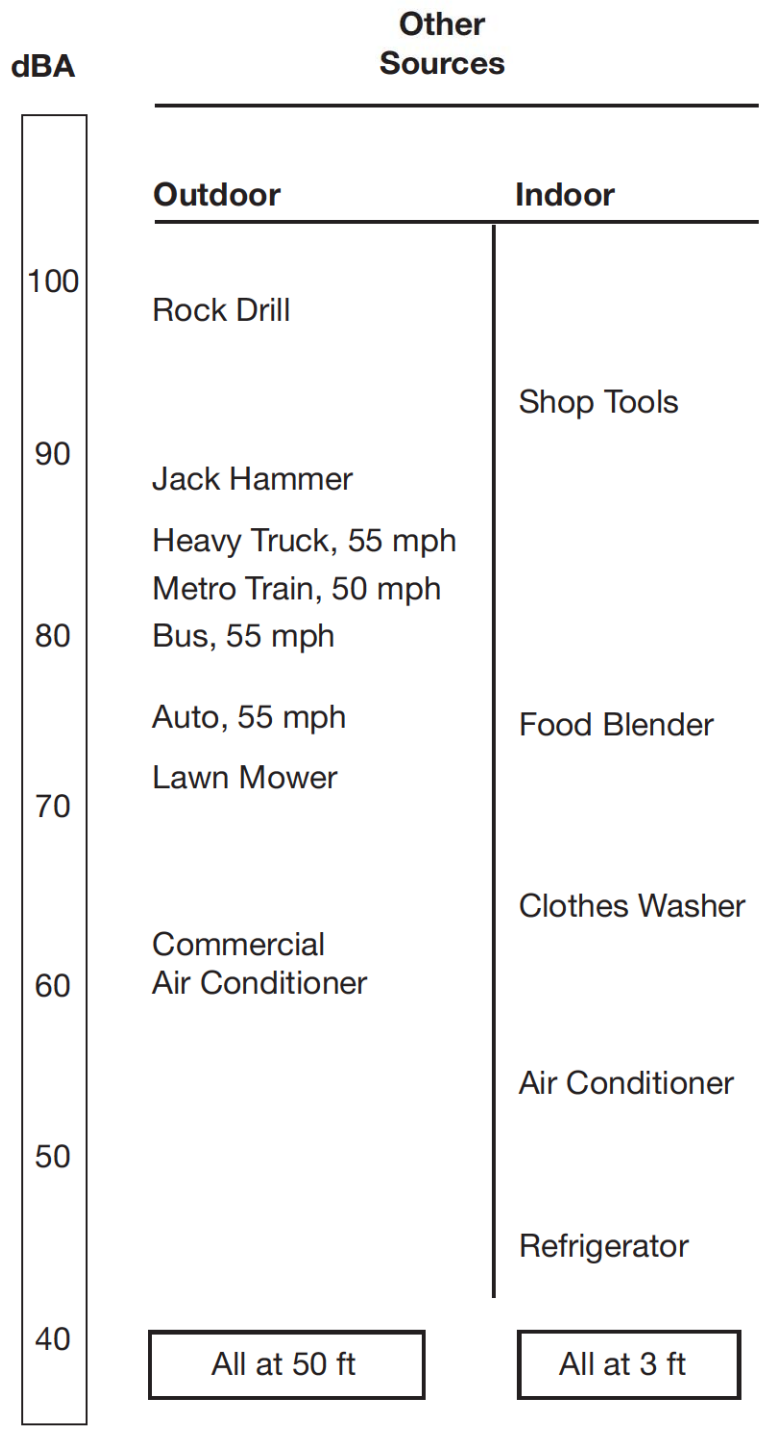
To describe environmental noise and to assess impacts on areas sensitive to community noise, a frequency weighting measure that simulates human perception is customarily used. The frequency weighting scale known as A-weighting best reflects the human ear's reduced sensitivity to low frequencies and correlates 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

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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[1], 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-

[1] LADWP has purchased Chance Ranch and it is speculated that no one currently lives there. However, for the purposes of this analysis, it is considered a sensitive receptor as individuals are not precluded from staying at the residence for extended periods of time.

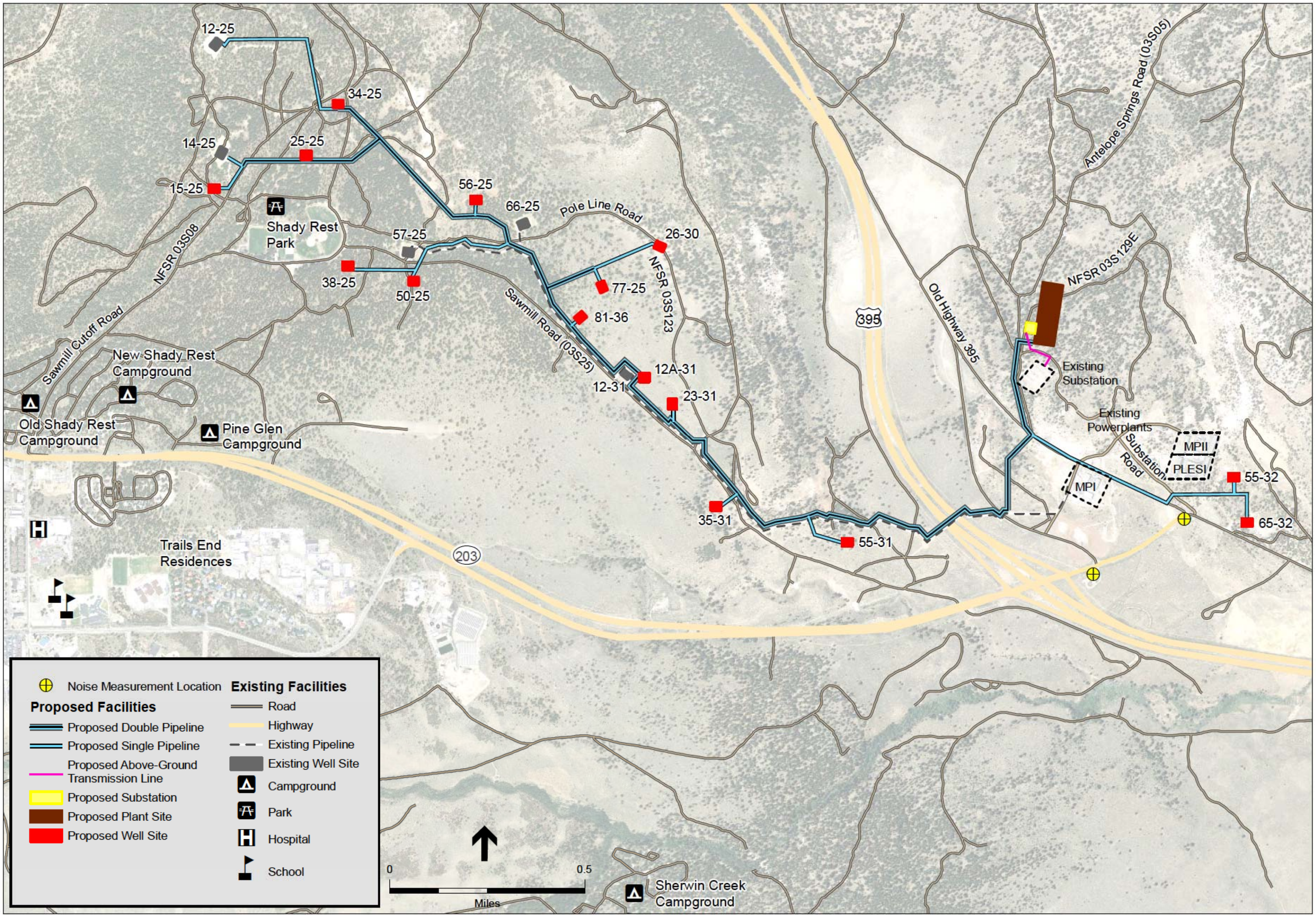
southwest of Well Site 38-25. Sherwin Creek Campground is located approximately 1.6 miles to the southwest of the CD-IV power plant site and 0.9 mile from Well Site 55-31. The John Muir Wilderness Area is about 2.5 miles to the south of the CD-IV power plant site. For an illustration of the sensitive receptor locations relative to the CD-IV Project, refer to Figure 3.11-2.

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.



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

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Figure 3.11-2
Noise Measurement Locations

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).

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.

TABLE 3.11-2
MONO COUNTY EXTERIOR NOISE LIMITS

Receiving Land Use	Time Period	Noise Level (dBA) for Noise Zone Classification		
		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.

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).

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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 CD-IV 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. Currently well 57-25 uses a scale inhibitor at a usage rate of 1500 gallons per year.

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. These drilling additives include the following: barite (barium sulfate); Portland cement (calcium silicates); Drispac Polymer; ground almond shell fiber seal; bentonite clay; gypsum; silicate powder, aluminum silicate, and crystalline silica.

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

[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.

construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427);and

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.

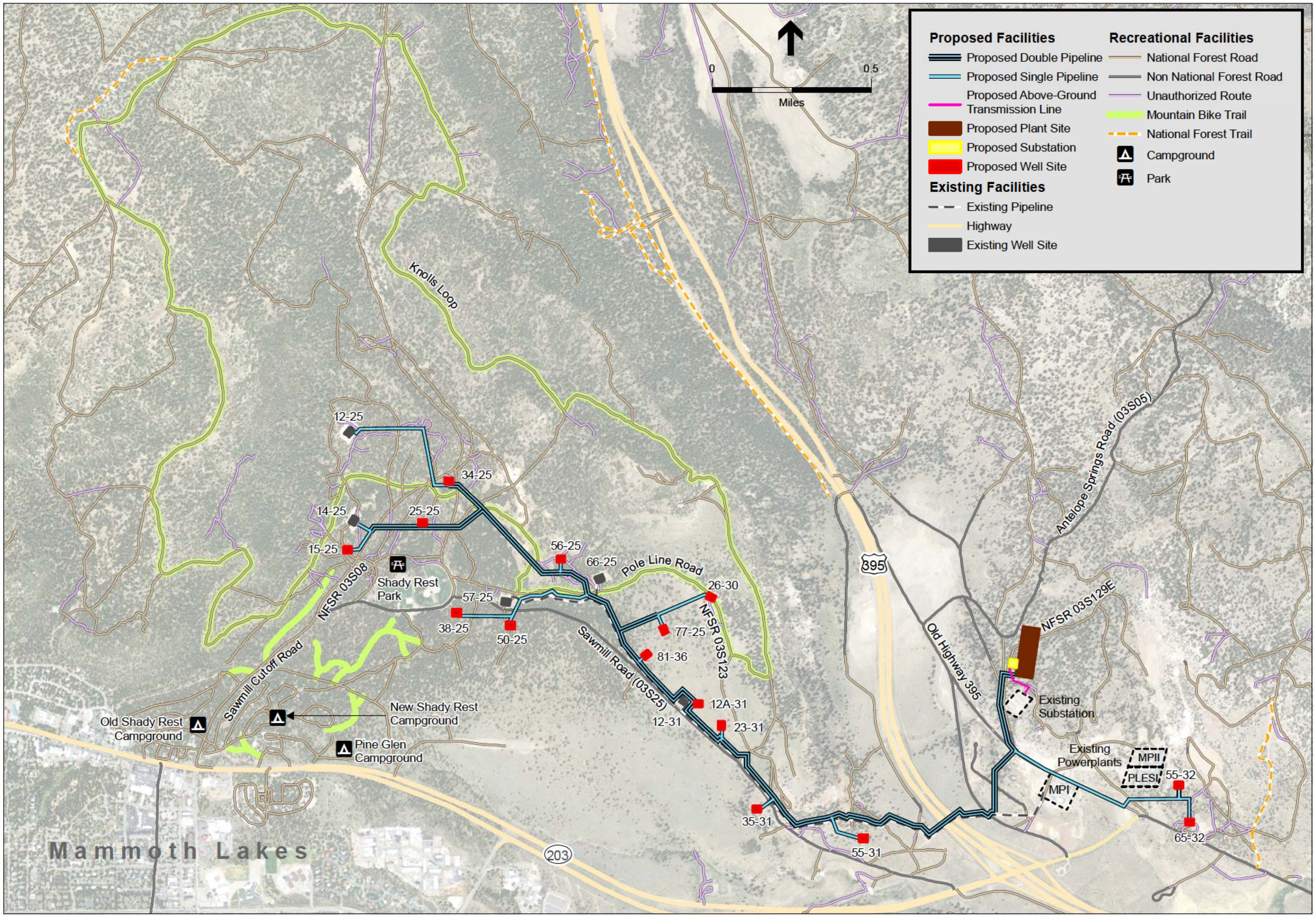
Bicycle Routes

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 off-highway vehicle (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



SOURCE: USFS, 2011; Ormat, 2011

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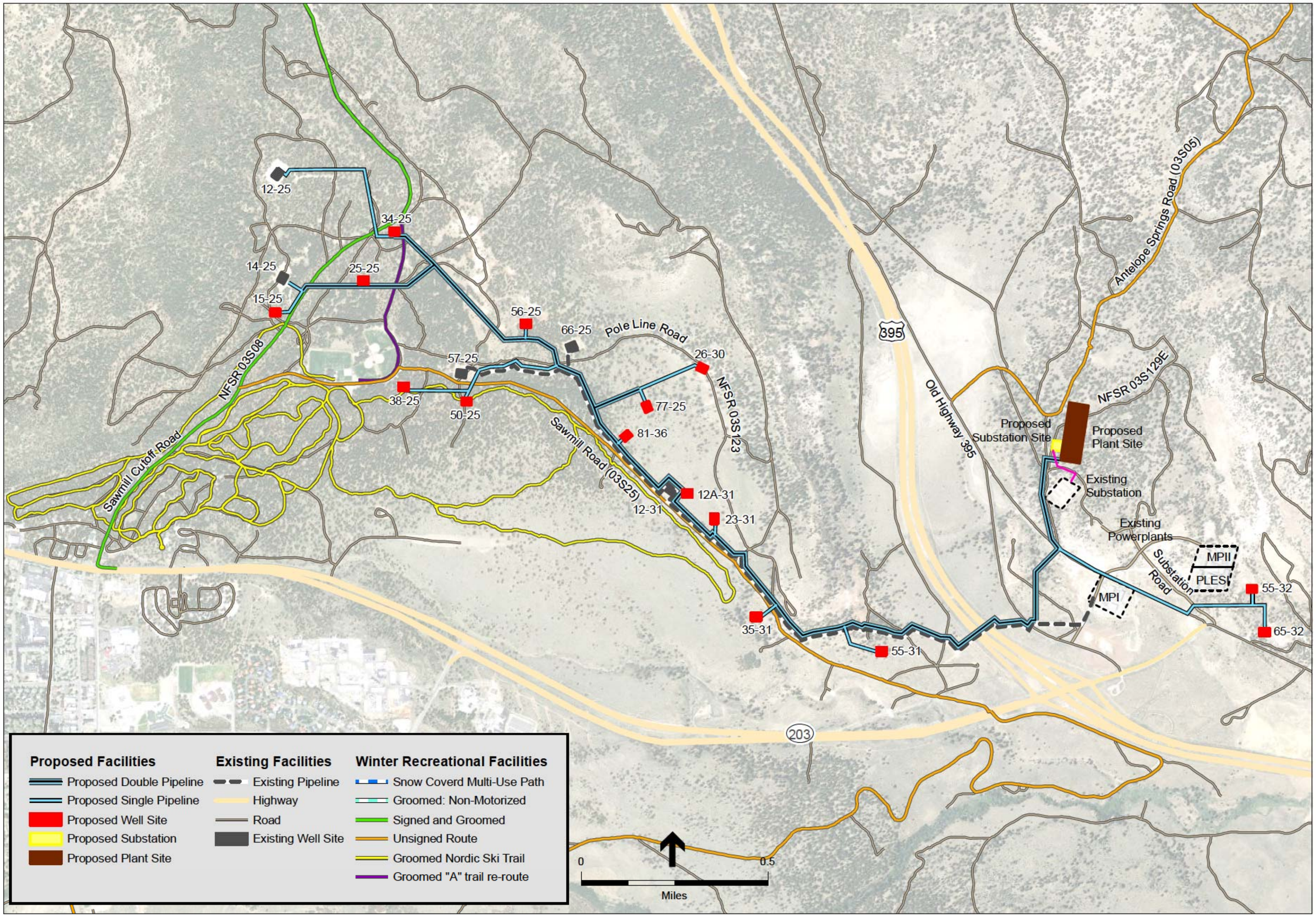
Figure 3.14-1
Recreational Facilities

recreation use, and ‘unauthorized roads’, which are closed to motorized use but available to non-motorized recreation use.

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 (as well as open forest areas) 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). OSV staging was formerly located at the New Shady Rest Campground and was moved to Shady Rest Park in 2009 due to access needs resulting from existing geothermal operations. The current staging area was intended as a temporary location during the planning process for the proposed Inyo National Forest Shady Rest Motorized Staging Project (see Table 4.1.1). It is noted that the design of the Shady Rest Park staging area does not have the same operational flexibility as the former New Shady Rest Campground staging area. From the Shady Rest Park staging area there 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 OSV riding and skiing. However, existing plowing of Sawmill Cutoff Road has limited use of the road by OSV riders. 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).



SOURCE: Ormat, 2011; TOML, 2009; TSMP, 2011

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Figure 3.14-2
Winter Recreation Activities

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. Forest Order 04-95-02 restricts shooting from the vicinity of the proposed geothermal plant site; however, there is an area along Antelope Springs Road that is used informally for shooting.

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.

3.15 Socioeconomics and Environmental Justice

This section describes the socioeconomic and demographic setting for the CD-IV 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 CD-IV 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)[1] 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)[2] 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 t o the Proposed Action would be via two Caltrans facilities:

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1 Mono County maintains Sawmill Road (03S25) from near the junction of SR 203 with U.S. Highway 395 to the junction with Sawmill Cutoff Road (NFSR 03S08).

2 Under permit from the USFS, the Town of Mammoth Lakes maintains Sawmill Cutoff Road from the intersection with SR 203 to the end of the pavement near Shady Rest Park (O3S308) and Shady Rest Park access road (03S08N and 03S08P).

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 [3] 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

[3] National Forest System Roads (NFSR) include 'system' roads, which are designated roads included in the National Forest's transportation system. 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". Other roads in the area include 'unauthorized' roads, which range from narrow singletrack routes used by motorcycles, to wider routes passable by trucks and other full-size vehicles. 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 'unauthorized' or 'non-system' routes are being used by the public to recreate on the national forest, none of them are currently part of the official transportation system. Motor vehicle use is prohibited on these roads. Any unauthorized routes approved as part of this project would be converted into a NFSR.

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.

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 CD-IV 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 CD-IV 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 CD-IV Project. Local policies are described below.

3.17.2.1 Local

Mono County

The following policies contained in the Mono County General Plan Safety Element (Mono County, 1993) include fire protection requirements:

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 CD-IV 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.

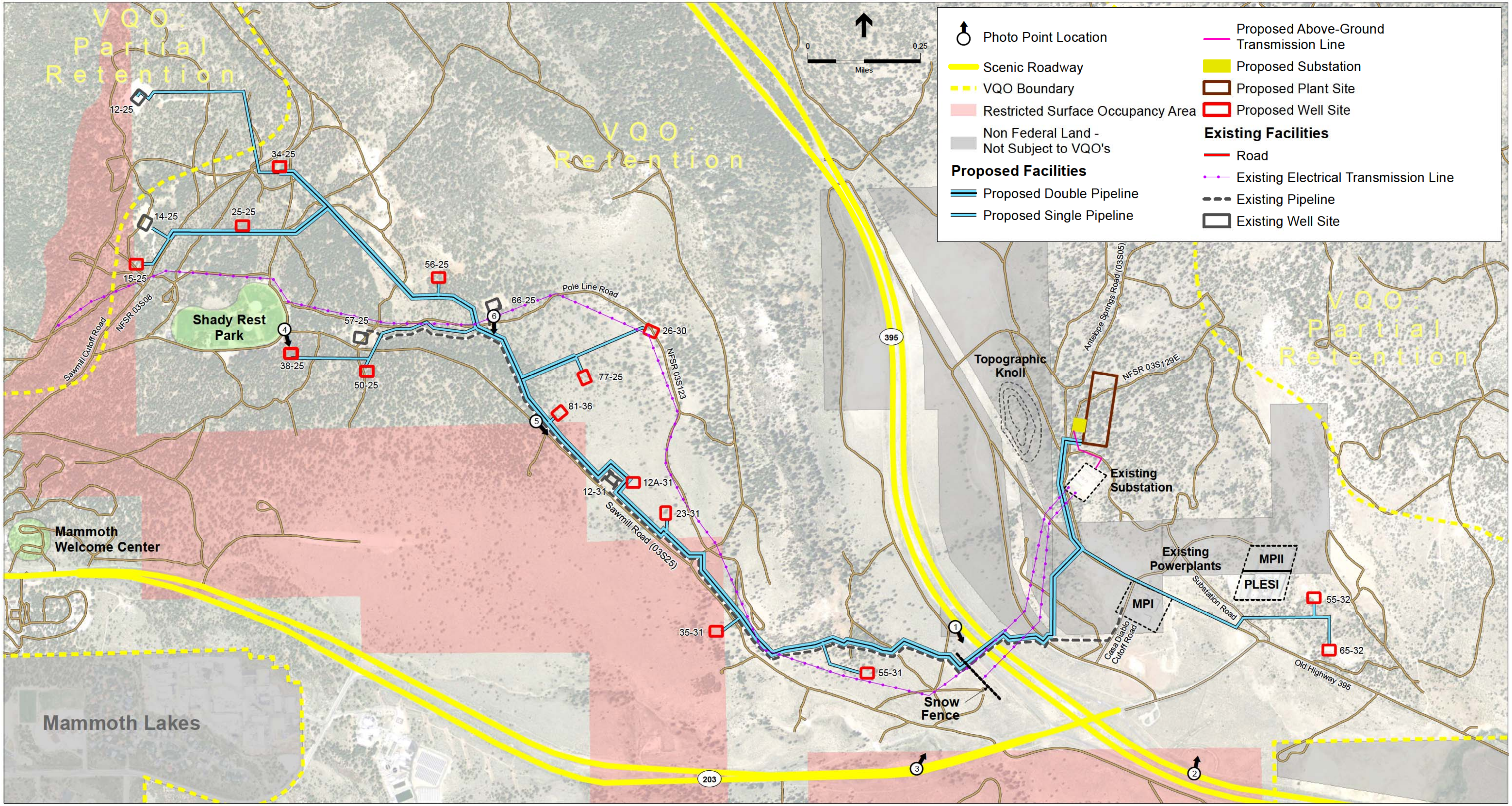
To the west of Highway 395 is an SCE electric transmission line which generally parallels Sawmill Road (03S25) and crosses U.S. Highway 395 just north of its intersection with SR 203, and is visible from U.S. Highway 395. Also paralleling Sawmill Road are existing above ground geothermal pipelines which 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)

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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

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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 CD-IV 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 five VQOs are; “Preservation,” the most restrictive designation, followed by “Retention,” “Partial Retention,” “Modification,” and “Maximum 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.

The "modification" (M) designation allows management activities that may visually dominate the original characteristic landscape; however, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that that its visual characteristics are those of natural occurrences within the surrounding area or character type. The "maximum modification" (MM) designation allows management activities of vegetative and landform alternations that may dominate the characteristic landscape; however, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, activities consistent with the "maximum modification" designation may not appear to completely borrow from the naturally established form, line, color, or texture and may be out of scale or contain detail which is incongruent with natural occurrences as seen in the foreground or middle ground (USFS, 1974).

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*. Additional discussion of groundwater resources, as well as surface water features hydrologically related to geothermal resources, is presented in Section 3.7, *Geothermal and Groundwater Resources*.

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

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.

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 (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).

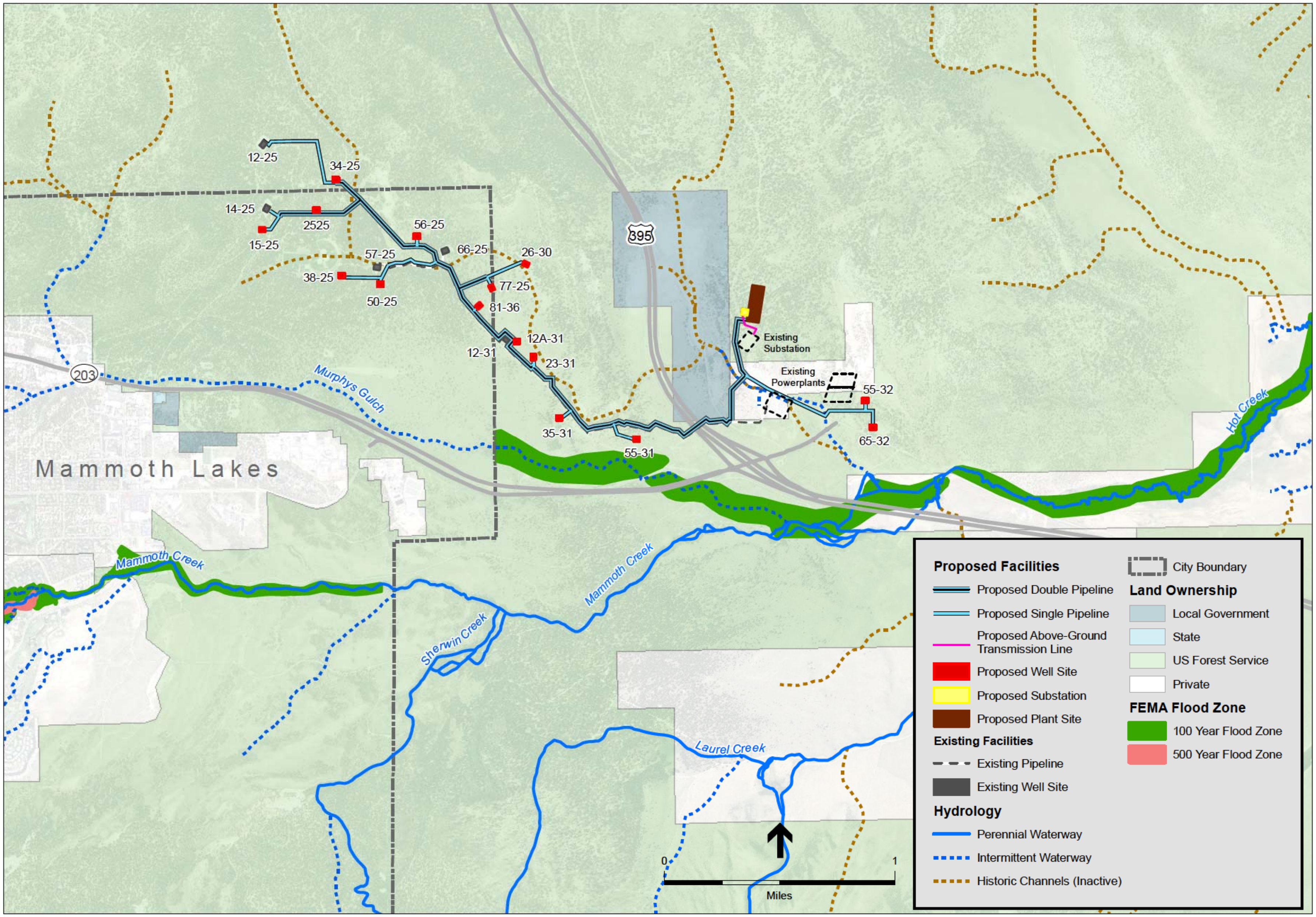
Flooding

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



SOURCE: FEMA, 2010; NHD, 2011; Ormat, 2011

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Figure 3.19-1

FEMA Flood Zones and Surface Hydrology

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 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 Policies/ 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-IV Project are discussed in the impact analysis for hydrologic resources, found in Section 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 3.19-3. 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 3.19-3
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 (this would not include USFS lands). 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.

CHAPTER 4
Environmental Consequences

4.1 Introduction

This chapter assesses environmental consequences or impacts that would result from the implementation of the Proposed Action or the alternatives described in Chapter 2. These analyses consider both short-term impacts during construction and decommissioning, and long-term impacts during operation and maintenance. The scope of the impact analyses presented in this chapter is commensurate with the level of detail for the alternatives provided in Chapter 2, *Proposed Action and Alternatives*, and the availability and/or quality of data necessary to assess impacts. Baseline conditions for assessing the potential environmental impacts for each resource area are described in Chapter 3.

The impact assessment that follows focuses on the general impacts that could occur as a result of implementing the Proposed Action and each of the alternatives. The methodology for this assessment conforms with the guidance found in the following sections of the CEQ regulations for implementing NEPA: 40 CFR Section 1502.24, *Methodology and Scientific Accuracy*; 40 CFR Section 1508.7, *Cumulative Impact*; and 40 CFR Section 1508.8, *Effects*. The CEQ regulations require agencies to "rigorously explore and objectively evaluate" the impacts of the alternatives. The methodologies used in the impact assessment also conform to the requirements of CEQA (Public Resources Code §21000 et seq.), including the *Guidelines for Implementation of the CEQA* (Title 14 CCR §15000 et seq.). This chapter discusses short- and long-term direct, indirect, and cumulative impacts of the Proposed Action and alternatives; identifies mitigation measures to address adverse impacts; and summarizes the residual and unavoidable adverse impacts on an issue-by-issue basis.

4.1.1 Analytical Assumptions

The following impacts analysis was conducted with the following assumptions:

1. The laws, regulations, and policies applicable to the BLM, which has the responsibility for managing all geothermal operations on federal lands leased for geothermal resource development under the terms of the Geothermal Steam Act of 1970, would be applied consistently for all action alternatives.

2. The laws, regulations, and policies applicable to the USFS, which has the responsibility for managing and administering surface activities within national forests, would be applied consistently for all action alternatives.

3. The proposed CD-IV facilities would be constructed, operated, maintained, and decommissioned as described in each action alternative.

4. Short-term impacts are those expected to occur during the construction phase (approximately 16 months) and over the life of the CD-IV Project as up to 16 geothermal wells are proposed (approximately half of the wells would be production wells and the other half would be injection wells). Short-term impacts are also expected during Project decommissioning. Long-term impacts are those that would occur throughout the operation and maintenance phase (approximately 30 years).

4.1.2 Types of Effects

The potential impacts from those actions that would have direct, indirect, and cumulative effects were considered for each resource. The terms “effect” and “impact” as used in this document are synonymous and could be beneficial or detrimental.

Direct effects are caused by the action and occur at the same time and place as the action; indirect effects are caused by the action and occur later in time or further in distance, but are still reasonably foreseeable (40 CFR 1508.8). Cumulative impacts are those effects resulting from the incremental impacts of an action when combined with other past, present, and reasonably foreseeable future actions (regardless of which agency or person undertakes such actions) (40 CFR 1508.7). Cumulative impacts could result from individually insignificant but collectively significant actions taking place over a period of time. Short-term impacts occur only for a short time after implementation of a management action; for example, construction noise impacts from construction activities would be considered short term in nature. By contrast, long-term effects occur for an extended period after implementation of a management action; for example, operational noise during facility operations would be a long-term impact, as it would last for as long as the facility is in operation.

Section 1502.16 of the CEQ regulations forms the scientific and analytic basis for the comparison of alternatives as described under Section 1502.14, *Alternatives including the Proposed Action*. The environmental consequences chapter (Chapter 4) of this EIS/EIR consolidates the discussions of those elements required by Sections 102(2)(C)(i), (ii), (iv), and (v) of the NEPA which are within the scope of this EIS/EIR and as much of Section 102(2)(C)(iii) as is necessary to support the comparisons. Chapter 5 of this EIS/EIR discusses any adverse environmental effects which cannot be avoided, the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented.

4.1.3 Resources and Resource Uses Not Affected or Present in the Action Area

Resources or other aspects of the human environment that are not affected or present in the Casa Diablo area include: wild and scenic rivers; national scenic or historic trails, monuments, and national recreation areas; cooperative management and protection areas; outstanding natural areas; forest reserves; back country byways; and wild horses and burros.

4.1.4 Mitigation Measures Included in the Analysis

For impacts identified in the following resource sections, both PDMs and mitigation measures have been developed that would be implemented during all appropriate phases of the CD-IV Project from initial ground breaking to operations, and through closure and decommissioning. The measures include a combination of the following:

1. Measures that have been proposed by ORNI 50, LLC;
2. Regulatory requirements of other federal, state, and local agencies;
3. Mitigation measures developed by the lead agency's environmental consultant; and
4. Additional USFS- or BLM-proposed mitigation measures and best management practices.

The latter three categories are generically referred to as "mitigation measures" throughout this Draft EIS/EIR. Measures proposed by the ORNI 50, LLC are referred to as PDMs. Many of the other mitigation measures are required and enforced by agencies other than the BLM or the USFS. For instance, the National Historic Preservation Act (NHPA) Section 106 Programmatic Agreement will include a number of processes that will be included in the ROD. ORNI 50, LLC will be required by the ROD to comply with the requirements of those other agencies (see, e.g., 43 CFR 2805.12(a) (Federal and state laws and regulations), (i)(6) (more stringent state standards for public health and safety, environmental protection and siting, constructing, operating, and maintaining any facilities and improvements).

4.1.5 Cumulative Scenario Approach

This Draft EIS/EIR analyzes the cumulative impact of the construction, operation and maintenance, closure and decommissioning of the CD-IV Project power plant and all other elements of the Proposed Action, taking into account the effects in common with other past, present, and reasonably foreseeable future actions. The cumulative effects analysis highlights past actions that are closely-related either in time or space (i.e., temporally or in geographic proximity) to the Proposed Action, present actions that are ongoing at the same time this EIS/EIR was being prepared; and reasonably foreseeable future actions, including those for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends.

The intensity, or severity, of the cumulative impacts analysis considers the magnitude, geographic extent, duration, and frequency of the effects. The magnitude of the effect reflects the relative size or amount of the effect; the geographic extent considers how widespread the effect may be; and the duration and frequency refer to whether the effect is a one-time event, intermittent, or chronic. Varying degrees of information exist about projects within the cumulative scenario. Therefore, for resource areas where quantitative information was available, a quantitative analysis is provided; however, if said level of detail was not available, a qualitative analysis is provided. If the Proposed Action and alternatives would have no direct or indirect effects on a resource, the Draft EIS/EIR does not analyze potential cumulative effects on that resource. See, for example, Section 4.1.3, *Resources and Resource Uses Not Affected or Present in the Action Area*.

Table 4.1-1 (located at the end of this section) provides a comprehensive listing of all foreseeable projects that could contribute to a cumulative impact on the environment. Projects listed include geothermal development projects located on BLM-administered lands, other BLM and USFS actions/activities, and projects identified by local governments, such as the town of Mammoth Lakes. Table 4.1-1 presents the project name, location, type, status, and a brief description of each project, to the extent available. Most of the projects listed in Table 4.1-1 have been, are being, or would be required to undergo their own independent environmental review under NEPA or CEQA or both, as applicable.

For the Proposed Action, the cumulative scenario for each issue area includes all or a portion of the projects identified in Table 4.1-1.

With the exception of climate change, which is a global issue, the specific area of cumulative effect varies by resource. For each resource, the geographic scope of analysis is based on the topography surrounding the CD-IV Project and the natural boundaries of the resource affected, rather than jurisdictional boundaries. The geographic scope of cumulative effects often extends beyond the scope of the direct effects, but not beyond the scope of the direct and indirect effects of the Proposed Action and alternatives.

In addition, each project in a region would have its own implementation schedule, which may or may not coincide or overlap with the Proposed Action's schedule. This is a consideration for short-term impacts from the proposed CD-IV Project. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the proposed CD-IV Project.

TABLE 4.1-1
CD-IV CUMULATIVE PROJECTS

Project Name	Location	Description	Status/Schedule	Approximate Distance from Proposed Project
Other Casa Diablo Geothermal Development Projects				
Mammoth Pacific I Replacement Project	Town of Mammoth Lakes (northeast of U.S. Highway 395 and SR 203 junction, Mono County)	MPLP proposes to replace the aging MP-I power plant on about 5.7 acres of land located between the existing MP-I and MP-II plant sites. The new M-I power generation facilities would replace the existing MP-I power generation facilities and the existing MP-I power generation facilities would be dismantled and removed. Project operations would result in increased generation of electricity and lower fugitive emissions of motive fluid, isobutene from plant equipment.	April 2012 – November 2012	Overlaps with Project area.
Mammoth Pacific II Project	Town of Mammoth Lakes (northeast of U.S. Highway 395 and SR 203 junction, Mono County)	Existing 15 MW geothermal electric generating facility and production and injection well field. Located approximately 1,200 feet northeast of the MP-I plant on land referred to as "G2," the MP-II project has been operating since 1990. The two projects have been integrated by MPLP and geothermal fluid discharged from either of the plants can be injected into any of the available injection wells.	Currently operates under an existing Conditional Use Permit issued by Mono County.	Overlaps with Project area; northwest of well site facilities 55-32 and 65-32.
PLES-I Project	Town of Mammoth Lakes (northeast of U.S. Highway 395 and SR 203 junction, Mono County)	This existing 15 MW PLES-I project includes a geothermal electric generating facility and is located immediately south of the MP-II project power plant. The plant site is also referred to as "G3."	Currently operates under approved Plans of Operation from the U.S. Department of Interior's Bureau of Land Management.	Overlaps with Project area; northwest of well site facilities 55-32 and 65-32.
Highway and Capital Improvement Projects				
Digital 395 Middle Mile Project	*Follows U.S. Highway 395 throughout Carson City, Nevada and Barstow, California*	*Construction of a new 583-mile, fiber network that would mainly follow Highway 395. The proposed service area encompasses 36 communities, six Indian reservations and two military bases. The new unused, high-capacity fiber optic line would be available to the region's last mile providers to expand or enhance service to households and businesses; as well as to government agencies or carriers seeking local or long-haul transport.*	*Environmental assessment completed in November 2011. Construction estimated to begin early 2012*	*Overlaps with Project area (Highway 395 pipeline crossing. The cable will be installed "in" Sawmill Cutoff Road.*
New Airport Terminal	Mammoth Yosemite Airport (Town of Mammoth Lakes)	Construction of a new airport terminal with capacity to manage increased enplanements. Includes 271 space parking lot and new airplane apron for an increased number and larger airplanes.	Oct. 2011 CIP indicates that the 2011/2012 budget will cover prelim. ALP currently underway.	Approximately 4 miles east of Project area.
Airport Security Upgrades	*Mammoth Yosemite Airport (Town of Mammoth Lakes)*	*New 8-foot tall security fence with 12 foot gates and security cameras.*	*Construction scheduled to occur in 2012-2013*	*Approximately 4 miles east of Project area.*

TABLE 4.1-1 (Continued)
CD-IV CUMULATIVE PROJECTS

Project Name	Location	Description	Status/Schedule	Approximate Distance from Proposed Project
Highway and Capital Improvement Projects (cont.)				
Sierra Nevada Sidewalk Project	Sierra Nevada Road (Town of Mammoth Lakes)	8-foot wide sidewalk construction along the north side of Sierra Nevada Road from Laurel Mountain to Chaparral Road.	Construction expected to occur summer of 2012.	Approximately 1.3 miles southwest of Project area.
Sierra Park Gap Closure	Sierra Park Road (between Old Mammoth Road and Sierra Park)	Project will construct and continue the 8-foot wide sidewalk, landscaping, and drainage improvements along Sierra Nevada Road.	Construction expected to occur summer of 2012.	Approximately 1.3 miles southwest of Project area.
Waterford Bridges project	*Old Mammoth Road and Mammoth Creek crossing*	*Construct bridge and pedestrian improvements over Mammoth Creek to provide emergency access for residents north of Mammoth Creek to Old Mammoth Road.*	*Summer 2012 and 2013.*	*Approximately 1.5 miles southwest of Project area.*
Meadow Creek Connector Path	*Adjacent to Old Mammoth Road (between Mammoth Creek Park and Old Mammoth Road /Minaret Road intersection)*	*Construction of a multi-use connector path that will connect Mammoth Creek Park to the Main Path at the intersection of Minaret and Old Mammoth Road, closing a gap in the Town's Main Path.*	*Design this summer; construction next summer.*	*Approximately 1.5 miles southwest of Project area.*
Tavern Road Sidewalks	*Tavern Road (from Sierra Park to Laurel Mountain)*	*Project will reconstruct and improve sidewalks, landscaping, and drainage along Tavern Road.*	*Construction expected to occur summer 2013.*	*Approximately 0.75 mile southwest of Project area.*
Lake View/Lake Mary Road Intersection Improvements	Lake View Road and Mary Road intersection (Town of Mammoth Lakes)	Provide separate south bound left and right turns from Lake View Road to Lake Mary Road. Install a hydronically heated pavement section on Lake View Road.	Improvements are expected to occur this summer.	Approximately 2 miles southwest of Project area.
Transit Parking Lot Paving	*Town of Mammoth Lakes*	*Paving of the existing impound lot and install proper oil/sediment separators. Facility will accommodate additional transit.*	*Summer 2012 and 2013.*	
Lower Canyon Boulevard Rehabilitation	*Canyon Boulevard (Town of Mammoth Lakes)*	*Reconstruction of Canyon Boulevard from Forest Trail to Hillside Drive. The project will also include new curb, gutter, sidewalks, lights, and improvements to the storm drainage system.*	*Construction expected to occur summer of 2013.*	*Approximately 1.5 miles southwest of Project area.*
5-Year Road Rehabilitation Project	*Various road sections*	*Rehabilitation of various road segments throughout the Town of Mammoth Lakes, including Sierra Nevada (Sierra Park to Old Mammoth),*	*2010 through 2016*	*Various*

**TABLE 4.1-1 (Continued)
CD-IV CUMULATIVE PROJECTS**

Project Name	Location	Description	Status/Schedule	Approximate Distance from Proposed Project
Parks and Recreation Projects				
Trails End Park	*Just north of Meridian Boulevard and Wagon Wheel Road*	*This new park consists of a playground, a skate park for all ages, and a water play area. Phase I is complete. Phase 2 includes landscaping, a pavilion, and a playground; Phase 3 may include a smaller additional skate area.*	*Construction of Phase 2 expected to occur summer of 2012.*	*Approximately 0.75 mile south of Project area.*
Whitmore Track Facility	*Whitmore Regional Park on Benton Crossing Road near Highway 395*	*Joint effort by the High Sierra Striders and the Town of Mammoth Lakes, this project includes construction of a high-performance 9-lane track, synthetic infield, locker rooms, storage and concession space, dog park, picnic pavilion, and parking lot with access road. Project would occur on land leased by the Town from LA Department of Water and Power.*	*MND adopted in October 2011, approved by Mono County Planning Commission in December 2011. Construction anticipated to begin Spring/Summer 2012.*	*Approximately 5 miles east of Project area.*
College Connector Path	*Meridian Boulevard (Town of Mammoth Lakes)*	*Includes a Class I off-street bike path adjacent to Meridian Boulevard, College Parkway and connecting to the Main Path (part of the Trails System Master Plan). This path will link MUSD schools, library, recreational uses, retail and commercial centers, and Cerro Coso Community College.*	*Currently under design. Construction expected to occur next summer.*	*Approximately 0.75 mile south of Project area.*
Lake Mary Road Bicycle Path Completion Project	*Lake Mary Road (Town of Mammoth Lakes)*	*Includes a Class I off-street bike path adjacent to Lake Mary Road (part of the Trails System Master Plan). This will complete the Main Path network through the town to Lake Mary.*	*Summer 2012 – 2013*	*Approximately 2 miles southwest of Project area.*
Sawmill Cutoff Road Reconstruction Project	Sawmill Cutoff Road, Town of Mammoth Lakes	Includes reconstruction of Sawmill Cutoff Road so that roadway can be used year-round. Project also includes extension of a staging area for winter and summer activities.	Grant is currently under review.	Overlaps with Project area along Sawmill Cutoff Road.
Inyo National Forest Shady Rest Motorized Staging Project	Shady Rest Park	Inyo National Forest received an OHV grant from the State of California to support recreation planning efforts for the “Shady Rest” area within the Town of Mammoth Lakes. The desired outcome of this project is to design and approve development of a new motorized staging area for year-round use at the Shady Rest area.	Currently in the planning phase.	Overlaps with Project area; adjacent to well site 38-25.
Development Projects				
Downtown Neighborhood District Plan	Downtown Area of Mammoth Lakes	Revitalization for the Mammoth Lakes’ Downtown area, encompassing Main Street/SR 203 corridor from the town entrance to Minaret Road, the North Old Mammoth Road area, and the Shady Rest site.	Currently in planning phase; unlikely to overlap with proposed action. Final Downtown Concept for Main Street approved September 2010.	Overlaps with Shady Rest Park.

**TABLE 4.1-1 (Continued)
CD-IV CUMULATIVE PROJECTS**

Project Name	Location	Description	Status/Schedule	Approximate Distance from Proposed Project
Development Projects (cont.)				
Hidden Creek Crossing	Town of Mammoth Lakes	Planning effort aimed to revitalize the Shady Rest Tract, which has long been identified as a critical affordable/workforce housing site for the town.	Neither an application nor a Master Plan for this project has been prepared.	Overlaps with Shady Rest Park.
Mammoth Creek crossing	Minaret Road and Main Street (Town of Mammoth Lakes)	Redevelopment of three of the four corners that comprise the Main Street-Lake Mary Road/Minaret Road intersection with a combination of resort accommodations, retail uses, and public plazas.	Final EIR published in April 2009. General plan amendment approved but land is not yet entitled.	Approximately 1.5 miles southwest of the Project area.
Mammoth View Project	Bounded by Main Street, Mountain Boulevard, Alpine Circle (Town of Mammoth Lakes)	Removal of three existing motel buildings from the project site and development of the site with a 54-room hotel, 24 townhouse condominium, and 28 freestanding condominium cabin units.	Initial Study published May 2011 and project has been approved. Town of Mammoth Lakes is currently coordinating with Mammoth View about right-of-way improvements.	Approximately 1 mile southwest of the Project area.
Old Mammoth Place	Old Mammoth Road and Lake Mountain Road, Town of Mammoth Lakes	Mixed use development for a condominium hotel with up to 488 hotel rooms and 8 units for workforce housing. Also would include outdoor plazas, restaurant space, commercial, conference areas, spa, and underground parking structure.	Application approved in March 2011.	Approximately 0.75 mile southwest of Project area.
Search and Rescue Facility	1315 Meridian Boulevard (Town of Mammoth Lakes)	New permanent 3,850-square foot facility for the Mono County Sheriff's Search and Rescue. Building would accommodate up to seven vehicles and a small office and meeting area.	MND adopted May 2011. Under construction.	Approximately 0.75 mile south of Project area.
Sierra Star Master Plan Project	South of Main Street and along both sides of Minaret Road (Town of Mammoth Lakes)	Development of approximately 42 acres of the 114-acre site surrounding the existing Sierra Star Golf Course. The project proposes 763 new dwelling units.	Draft EIR published April 2007.	Approximately 1.5 miles southwest of the Project area.
Snowcreek Master Plan	Encompasses areas north and south of Old Mammoth Road west of Fairway Drive (Town of Mammoth Lakes)	Master plan update which incorporates recreational facilities, golf course, school uses, Mammoth Lakes fire station, and land for a water treatment facility	Final EIR supplemental published in May 2009. Plan has been approved but land is not entitled.	Approximately 1.5 miles southwest of Project area.
Mammoth View Project	Bounded by Main Street, Mountain Boulevard, and Alpine Circle (Town of Mammoth Lakes)	Plan is comprised of a 54-room hotel, 24 townhouse condominium units in two buildings, and 28 freestanding condominium cabin units on a 5.5 acre site.	MND published May 2011. Project has been approved.	Approximately one mile southwest of Project area.

TABLE 4.1-1 (Continued)
CD-IV CUMULATIVE PROJECTS

Project Name	Location	Description	Status/Schedule	Approximate Distance from Proposed Project
Development Projects (cont.)				
Trails System Master Plan	Town of Mammoth Lakes	Planning effort that focuses on the trail system plan within the Town's Urban Growth Boundary containing public input/surveys, gap analysis and potential recommendations for future implementation. The Plan also contains a secondary effort that helps define the interface potential between the UGB and public lands outside the boundary.	Plan recently adopted in November 2011. Some soft surface trails planned to be constructed in next five years but specifics have not been developed.	Overlaps with Project area.
Parks and Recreation Master Plan Update	Town of Mammoth Lakes	Plan assesses the Town's recreation needs for the future and establishes goals and policies that will guide park improvements. Contains an analysis of the supply, demand and needs for park and recreation facilities and services within the Town and includes recommendations to help meet challenges of providing parks and recreation facilities.	Plan and accompanying General Plan Amendment 2012-01 adopted in February 2012.	Overlaps with Shady Rest Park.

NOTE: *Italicized* text indicates projects with tentative construction schedules that would potentially overlap with the construction schedule for the Casa Diablo Geothermal Development Project.

SOURCES: National Telecommunication and Information Administration and CPUC, 2011; Town of Mammoth Lakes, 2011, 2012; MLTPA, 2012; Bernasconi, 2012;

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4.2 Air Resources

4.2.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts to air resources. Impacts are identified and evaluated based on air pollutant estimates, public health risk, odors, and cumulative impacts that would be generated during construction, operation and maintenance, and decommissioning of the Proposed Action.

4.2.1.1 Construction Emissions

Maximum day and annual construction emissions were estimated using Project-specific information identified in the ORNI 50, LLC application for the CD-IV Project (MPLP, 2010), as well as other information provided by ORNI 50, LLC (Ormat, 2011). The information includes the overall construction schedule, expected to occur in two separate 8-month phases in 2013 and 2014, followed by 2 months of additional well development and pipeline work in 2015. Appendix C.1, *Air Pollutant Emission Estimates*, contains the air pollutant exhaust and fugitive dust emissions estimates calculations and all of the assumptions used to estimate the construction emissions that would be associated with the CD-IV Project. For the purposes of the air resources analysis, construction emissions that would be associated with the CD-IV Project are described in terms of three main activity source types, including: power plant construction, well development construction, and pipeline construction. It is expected that each of the constriction phases would include approximately 8 months of power plant construction, 6 months of well development construction, and 6 months of pipeline construction, and the activity sources would overlap in schedule.

For each of the construction activity sources, the following types of assumptions were compiled:

1. A list of the types of off-road construction equipment and on-road vehicles to be used;
2. The number of pieces of each type of off-road equipment and on-road vehicles;
3. Daily usage rates in terms of hours per day or miles traveled per day for each piece of off-road equipment and on-road vehicles, respectively; and
4. The horse-power (hp) rating for each type of off-road equipment used.

Off-Road Equipment Exhaust

Air pollutant emissions, including ROG, NO_x, CO, SO_2, PM10, and PM2.5 that would be generated by off-road construction equipment (e.g., excavators, graders, loaders, backhoes, etc.,) were estimated using a variety of emissions models and regulatory emission factors. CARB’s Offroad emissions inventory database was used to develop air basin specific construction equipment emission factors for calendar year 2013 for ROG, NO_x, and PM10. The Offroad database provides data for only NO_x, PM10, and total hydrocarbons (THC), so factors identified by CARB (CARB, 2012a) were applied to convert THC emissions rates to ROG emissions rates, and CARB’s Offroad2007 emissions model was used to estimate construction equipment emission factors for CO and SO_2. PM2.5 construction equipment exhaust emission factors were calculated by multiplying the PM10 emission factors by the mass fraction of PM2.5 emissions in PM10 diesel exhaust, as provided by South Coast Air Quality Management District (SCAQMD)'s *Final–Methodology to Calculate Particulate Matter (PM) 2.5 and PM2.5 Significance Thresholds* (2006).

In addition to mobile off-road construction equipment, ORNI 50, LLC has identified the need for two large drill rigs that would each include approximately four engines with a combined engine rating of over 4,250 hp per drill rig (Ormat, 2011). Construction activities associated with the drill rigs would occur 24 hours per day for a period of approximately 30 days at each well site, and for the purposes of the maximum day scenario, it is expected that the two drill rigs would operate simultaneously. Based on actual fuel use data during recent well drillings (Ormat, 2012) compared to the maximum fuel consumption specifications for similar engines (Caterpillar, 2012), it is assumed that the engines on each drill rig would operate a combined total of approximately 16 hours per day. Because the drill rigs would be registered with CARB's Statewide Portable Equipment Registration Program, it is expected that the drill rig engines would meet USEPA and CARB Tier 2 standards for off-road engines. Therefore, the Tier 2 grams/brake horsepower-hour (g/bhp-hr) emission standards obtained from CARB and SCAQMD for ROG, NO_x, CO, and PM10 were used as worst case emission rates for the drill rigs (CARB, 2012b; SCAQMD, 2010). Default load factors from the Offroad emissions inventory database model were used with Tier 2 emission rates to calculate emissions factors for the drill rig engines. CARB's Offroad2007 emissions model was used to estimate drill rig emission factors for SO_2 and the PM2.5 drill rig exhaust emission factors were calculated by multiplying the Tier 2 PM10 emission factors by the mass fraction of PM2.5 emissions in PM10 diesel exhaust (SCAQMD, 2006).

Details of the off-road construction emissions calculations and model input and output are provided in Appendix C.1, *Air Pollutant Emission Estimates*.

On-Road Motor Vehicle Exhaust Emissions

Emissions of ROG, NO_x, CO, SO_2, PM10, and PM2.5from motor vehicles were calculated by multiplying the estimated vehicle-miles-traveled (VMT) by each type of vehicle estimated to be used during the construction phase by emission factors that were compiled running CARB's EMFAC2011 Burden Model for average model years and average speed during calendar year 2013 in Mono County. Daily emissions by vehicle class (i.e., light-duty gasoline-fueled trucks and heavy-duty trucks) are estimated using the EMFAC2011 emission factors multiplied by the estimated CD-IV Project-related vehicle trips (see Section 4.16-1, *Traffic, Transportation, and Circulation*) and the estimated daily mileage traveled by the vehicles. The daily emissions were multiplied by the number of annual work-days per activity phase to estimate the annual on-road vehicle exhaust emissions. Details of the on-road construction emissions calculations and model input and output are provided in Appendix C.1, *Air Pollutant Emission Estimates*.

Fugitive Dust Emissions

On-Site Construction Activities

Earth-disturbing activities such as excavation, filling, grading, and vehicle travel during construction of the CD-IV Project would generate fugitive dust emissions, including emissions of PM10 and PM2.5. Maximum daily fugitive particulate matter emissions generated at the CD-IV Project sites during construction were estimated using an emission factor developed by Midwest Research Institute (MRI). The emission factor is based on observations of construction operations in California and Las Vegas. The emission factor uses estimates of geologic dust emissions from construction activities. The emission factor is 0.11 tons PM10/acre-month of activity (or approximately 10 pounds PM10/acre-day, assuming approximately 21 workdays per month). The fugitive dust emission factor includes the effects of typical control measures such as routine watering (CARB, 2002) that are proposed for the CD-IV Project (see Section 4.2.2). It is estimated that power plant construction, well development construction, and pipeline construction would result in daily area disturbances of approximately 2.0 acres, 1.0 acre, and 0.5 acre per day, respectively.

Off-site Unpaved Road Travel

CD-IV Project-related dust emissions that would be generated by vehicle travel on unpaved roads was estimated using USEPA methodology identified in its AP-42 document (USEPA, 2006). Maximum daily and annual trip amounts associated with the well development and pipeline construction activities were derived from data provided in Section 4.16-1, *Traffic, Transportation, and Circulation*. It is expected that there would be negligible off-site unpaved road travel associated with construction of the power plant, and that each off-site trip related to pipeline and well development construction would result in an average of approximately 0.5 mile of travel on unpaved roads. This VMT amount was multiplied by the AP-42 predictive emission factor Equation 1a with appropriate variables as identified in AP-42 Section 13.2.2, *Unpaved Roads* (USEPA, 2006). The AP-42 emission factor was combined with an overall dust control efficiency of approximately 75 percent related to the proposed maximum speed limit on unpaved roads (see Section 2.2.3.3) and watering actively travelled unpaved roads (see Section 4.2.2). The overall unpaved road dust control efficiency of 0.75 percent is based on control efficiencies published by the SCAQMD (SCAQMD, 2007).

Public Health Risk

The primary hazardous air pollutant emissions that would be associated with construction of the Proposed Action and Alternatives are hydrogen sulfide (H_2S) released from geothermal fluid during well drilling and testing, and DPM exhaust emissions from on-site construction equipment. Small quantities of other hazardous air pollutants would be associated with gasoline-fueled vehicles also operating on-site during construction. The location of hazardous pollutant emissions from the well sites and construction equipment operation would vary across the CD-IV Project sites over the construction period, and thus would not be in a fixed location for long periods of time. The closest sensitive receptor to a CD-IV Project site is the Shady Rest Campground, approximately 0.5 mile to the west-southwest of Well Site 38-25, and the closest residences are along Trails End Road, approximately 0.8 mile southwest of Well Sites 38-25 and

50-25. Therefore, given the temporary nature of construction activities and the lack of long-term emissions that would occur at Site 38-25, health risks are assessed qualitatively and a full health risk assessment was not warranted.

Class I Areas

It is not likely that air pollutant emissions resulting from construction activity associated with the CD-IV Project would degrade the air quality of nearby Class I areas, including the John Muir Wilderness Area. This wilderness area is at elevations above 8,000 feet, and the CD-IV Project site is at an elevation of approximately 7,300 feet. Predominant westerly and northwesterly winds would likely carry pollutants toward Long Valley and away from the wilderness area.

4.2.1.2 Operation and Maintenance

Operation-related air pollutant emissions would be generated from exhaust and leaks from on-site equipment and from exhaust related to off-site vehicle use.

On-Site Equipment Emissions

Fugitive N-Pentane

As described in Section 2.6.6.5, the power plant motive fluid system of vaporized n-pentane would be designed as a closed loop, although fugitive leaks of n-pentane would be expected from the valves, connections, seals, and tubes of the closed system. The fugitive n-pentane, which is considered an ROG, would be released to the atmosphere. As described in Section 2.6.6.5, n-pentane leak detectors would be installed throughout the power plant facility and would be continuously monitored. ORNI 50, LLC has estimated a maximum fugitive n-pentane leak rate for the CD-IV Project of 410 lbs/day, and has requested this amount as permit limit from the GBUAPCD. Therefore, for the purposes of this analysis, it is estimated that up to 410 lbs/day of n-pentane would be released to the atmosphere every day during operation of the CD-IV Project.

Emergency Standby Diesel Equipment

The CD-IV Project power plant would also include operation of one approximately 800 bhp diesel-fueled emergency generator to provide backup power for critical plant control systems in the event of a power outage. Similarly, the proposed power plant would include one approximately 400 bhp diesel-fueled firewater pump to provide power to the firewater pump in the event of a fire emergency. The reported specifications for these proposed stationary diesel engines would meet the required USEPA and CARB tier requirements and the CARB Airborne Toxic Control Measure (ACTM) standards. The manufacturer’s recommendations for testing and maintenance of the emergency generators would be followed, allowing up to 50 hours per year of operation for maintenance and/or testing purposes (40 CFR Part 89). Diesel combustion emissions would occur during the intermittent testing and potential emergency use of these engines. ORNI 50, LLC has tentatively selected specific equipment manufacturers and models of engines that would be used at the CD-IV power plant site that would be the same equipment that ORNI 50, LLC has proposed for the replacement M-1 plant site.

The emissions data that would be associated with the M-1 emergency standby diesel equipment have been estimated and are presented in Mono County's MP-I Replacement Project Recirculated Draft EIR, Appendix H (Mono County, 2012). These emission estimates have been peer reviewed and are considered adequate for this analysis. Therefore, this analysis uses the emergency standby diesel equipment emission estimates from the MP-I Replacement Project to represent the emergency standby diesel equipment emissions that would be associated with the CD-IV Project.

Motor Vehicle Emissions

Emissions from motor vehicles used during operation and maintenance were estimating using emission factors that were compiled by running CARB's EMFAC2011Burden Model. Emissions that would be associated with commuting workers and periodic road snow plowing are estimated using the EMFAC2011emission factors multiplied by the estimated long-term operation and maintenance-related employee vehicle trips (up to 12 one-way trips; see Section 4.16-1, *Traffic, Transportation, and Circulation*) and the estimated additional snow plowing mileage (i.e., estimated to be 20 miles per day, twice a week, for five months) that would be associated with the CD-IV Project.

Public Health Risk

Given the relatively long distance from the proposed power plant site to the closest sensitive receptor locations, health risks are assessed qualitatively and a full health risk assessment was not warranted for operation and maintenance of the CD-IV Project.

Class I Areas

It is not likely that air pollutant emissions resulting from operation and maintenance activity associated with the CD-IV Project would degrade the air quality of nearby Class I areas, including the John Muir Wilderness Area. This wilderness area is at elevations above 8,000 feet, and the CD-IV Project site is at an elevation of approximately 7,300 feet. Operational emissions would be negligible, and predominant westerly and northwesterly winds would likely carry pollutant toward Long Valley and away from the wilderness area.

4.2.1.3 Decommissioning Emissions

Decommissioning-related impacts to air resources would be substantially similar to the construction-related impacts described above, with the exception that decommissioning activities would not likely require drilling.

4.2.1.4 Impact Analysis

Independent of NEPA, federal Clean Air Act section 176 requires federal agencies that are funding, permitting, or approving an activity to ensure the activity conforms to the applicable SIP adopted to eliminate or reduce air quality violations (42 USC §7506). The study area is classified as moderate non-attainment for the federal 24-hour PM10 AAQS. In addition, although currently classified as attainment, PM2.5 concentrations in the GBVAB have exceeded the federal 24-hour standard in recent years (see Section 3.2.1.3, *Criteria Air Pollutants*). Therefore, the applicable federal Clean Air Act conformity *de minimis* level (i.e., 100 tons per year) for PM10 and PM2.5 is used as a measure as to whether the Proposed Action or one of the Action Alternatives could result in an exceedance of a federal AAQS.

The study area is also classified as non-attainment for the state 1-hour and 8-hour ozone AAQS as well as the 24-hour PM10 AAQS. The GBUAPCD has not developed specific significance thresholds for construction or operation emissions. However, to provide a measure of whether the Proposed Action or one of the Action Alternatives could result in an exceedance of a state AAQS, construction and operation and maintenance mass exhaust and fugitive dust emissions are compared to the Imperial County Air Pollution Control District (ICAPCD) CEQA significance thresholds for ozone precursors (i.e., NO_x and ROG) and PM10 (ICAPCD, 2007). The applicable ICAPCD thresholds are identified in Table 4.2-1. The thresholds were selected for comparison, in part, because Imperial County is a rural county similar to Mono County with existing and proposed geothermal development projects. The Imperial County Air Basin is also a federal and state non-attainment area for both ozone and PM10.

TABLE 4.2-1
ICAPCD AIR QUALITY SIGNIFICANCE THRESHOLDS

Criteria Pollutant	Construction (pounds/day)	Operation (pounds/day)
Oxides of Nitrogen (NO_x)	100	55
Reactive Organic Gases (ROG)	75	55
Respirable Particulate Matter (PM10)	150	150

SOURCE: ICAPCD, 2007.

4.2.2 Project Design Measures

The analysis assumes that the following PDMs related to air resources are fully implemented:

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 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.

4.2.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to air quality if it would:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation;

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);

d) Expose sensitive receptors to substantial pollutant concentrations; or

e) Create objectionable odors affecting a substantial number of people.

CEQA allows for the significance criteria established by air districts to be used to assess the impact of a project on air quality. Because the GBUAPCD does not have established significance criteria for CEQA reviews, the GBUAPCD has elected to use the ICAPCD's daily emissions CEQA significance thresholds in this analysis to determine the significance of construction and operation impacts associated with the Proposed Action and the Action Alternatives (see Table 4.2-1, above). This analysis uses the applicable ICAPCD thresholds to gauge whether the Proposed Action or an action alternative could violate an air quality standard or contribute to an existing or projected air quality violation in the study area.

4.2.4 Alternative 1: Proposed Action

4.2.4.1 Direct and Indirect Impacts

Construction

Criteria Pollutant Emissions

The maximum annual air pollutant emissions that would be generated in the GBVAB during construction of the CD-IV Project have been estimated using the methodologies described above. It is estimated that approximately the same amount of construction-related activity would occur in 2013 and in 2014, with considerably less construction-related activity occurring in 2015. Therefore, the maximum annual construction emissions represent the emissions that would occur in 2013 and 2014. The PM10 and PM2.5 emissions estimates account for reductions from standard dust control measures, such as application of water and limiting speed on unpaved roads. The estimates for ROG, NO_x, CO, SO_2, PM10, and PM2.5 exhaust include no control-related reductions. This analysis estimates that the control efficiency associated with the standard dust control measures would be 50 percent for on-site activities, and approximately 75 percent for travel on unpaved roads.

As shown in Table 4.2-2, there are no applicable General Conformity *de minimis* levels for ROG, NO_x, CO, or SO_2 because the GBVAB is in attainment of the federal AAQS for those pollutants and those pollutants have not recently exceeded the applicable federal AAQS. Therefore, there is little possibility that CD-IV Project-related emissions of ROG, NO_x, CO, or SO_2 could violate a federal AAQS. The annual emissions for PM10 and PM2.5 would be below the respective NEPA *de minimis* level of 100 tons per year. Therefore, it can be concluded that construction of the CD-IV Project would not result in or contribute to an exceedance of a federal AAQS.

TABLE 4.2-2
PROPOSED ACTION MAXIMUM ANNUAL CONSTRUCTION EMISSIONS

Emissions Source	Maximum Annual Emissions (tons/year)[a]					
	ROG	**NO_x**	**CO**	**SO_2**	**PM10**	**PM2.5**
Power Plant Construction Off-road Equipment	<1	2	1	<1	<1	<1
Power Plant Construction On-road Vehicle	<1	2	6	<1	<1	<1
Power Plant Construction Exhaust Subtotal	***1***	***4***	***7***	***<1***	***<1***	***<1***
Well Construction Off-road Equipment	1	11	7	<1	<1	<1
Well Construction On-road Vehicle	<1	3	2	<1	<1	<1
Well Construction Exhaust Subtotal	***1***	***14***	***9***	***<1***	***1***	***<1***
Pipeline Construction Off-road Equipment	<1	1	1	<1	<1	<1
Pipeline Construction On-road Vehicle	<1	1	2	<1	<1	<1
Pipeline Construction Exhaust Subtotal	***<1***	***2***	***3***	***<1***	***<1***	***<1***
Total Fugitive Dust[b]	**---**	**---**	**---**	**---**	**4**	**1**
Grand Total (tons/year)	**2**	**20**	**19**	**<1**	**5**	**1**
General Conformity *de minimis* Level (tons/year)	---	---	---	---	100	100

NOTES:

[a] Exhaust and on-site fugitive dust emissions calculations and assumptions are provided in Appendix C.1.

[b] PM10 and PM2.5 emissions account for control measures (i.e., watering, 25 mph speed limit) that reduce on-site and dirt road travel dust by 50 percent and 75 percent, respectively, relative to uncontrolled emissions; other pollutant emissions do not account for emissions control reductions.

Table 4.2-3 provides the estimated maximum day air pollutant emissions that would be generated within the GBVAB during short-term construction activities associated with the CD-Project. As with the annual emissions, it was estimated that the general fugitive dust control measures would achieve an overall efficiency of 50 percent for on-site activities, and approximately 75 percent for travel on unpaved roads. As indicated in the table, the vast majority of the daily exhaust emissions would be associated with well development construction activities.

As shown in Table 4.2-3, there are no applicable ICAPCD significance criteria for CO, SO_2, or PM2.5 because the GBVAB is attainment of the state AAQS for those pollutants. Therefore, there is little possibility that the CD-IV Project-related emissions of CO, SO_2, or PM2.5 could violate a state AAQS. Although the maximum daily emissions for ROG would be below the respective

TABLE 4.2-3
PROPOSED ACTION MAXIMUM DAY CONSTRUCTION EMISSIONS

Emissions Source	Maximum Day Emissions (pounds/day)[a]					
	ROG	**NO_x**	**CO**	**SO_2**	**PM10**	**PM2.5**
Power Plant Construction Off-road Equipment	3	32	27	<1	2	2
Power Plant Construction On-road Vehicles	3	20	63	<1	1	1
Power Plant Construction Exhaust Subtotal	***7***	***53***	***90***	***<1***	***3***	***2***
Well Construction Off-road Equipment	11	206	118	<1	7	6
Well Construction On-road Vehicles	3	44	26	<1	2	1
Well Construction Exhaust Subtotal	***14***	***251***	***144***	***<1***	***8***	***8***
Pipeline Construction Off-road Equipment	3	32	28	<1	2	2
Pipeline Construction On-road Vehicles	2	8	31	<1	<1	<1
Pipeline Construction Subtotal	***5***	***40***	***59***	***<1***	***2***	***2***
Total Fugitive Dust[b]	**---**	**---**	**---**	**---**	**85**	**12**
Grand Total (maximum pounds/day)	**25**	**343**	**292**	**1**	**98**	**24**
ICAPCD Significance Thresholds (lbs/day)	75	100	---	---	150	---

NOTES:

[a] Exhaust and fugitive dust emissions calculations and assumptions are provided in Appendix C.1.

[b] PM10 and PM2.5 emissions account for control measures (i.e., watering, 25 mph speed limit) that reduce on-site and unpaved road travel dust by 50 percent and 75 percent, respectively, relative to uncontrolled emissions; other pollutant emissions do not account for emissions control reductions.

applicable ICAPCD significance threshold, the maximum daily emissions of NO_x would easily exceed the respective ICAPCD significance threshold; therefore, it can be concluded that the CD-IV Project could result in or contribute to an exceedance of the state 1-hour and/or 8-hour ozone AAQS. The estimated maximum daily PM10 emissions would not exceed the ICAPCD significance threshold, indicating that CD-IV Project-related PM10 emissions would not result in an exceedance of the state PM10 24-hour AAQS.

Implementation of **Mitigation Measure AQ-1**[1] would reduce NO_x exhaust emissions associated with mobile off-road equipment (e.g., dozers, graders, loaders, etc.) by approximately 20 percent. This would reduce the maximum day NO_x emissions by approximately 19 pounds. In addition, **Mitigation Measure AQ-2** commits the Applicant to using drill rig engines that meet Tier 2 or higher emissions standards; however, the daily significance threshold used for this analysis would still be exceeded.

The estimated construction maximum day PM10 emissions (98pounds) do not exceed the ICAPCD significance threshold (150 pounds); however, in accordance with CEQ guidance and BLM NEPA Handbook section 6.8.4, reasonable, relevant mitigation measures that could improve a proposed project can be applied to reduce or eliminate adverse impacts whether or not

[1] See Section 4.2.9 for all mitigation measures.

the impacts are "significant" as that term is defined by NEPA. For the CD-IV Project, approximately 87 percent of the maximum daily PM10 emissions would be in the form of fugitive dust. Although PM10 emission levels would not reach the threshold established by ICAPCD, the emission estimates incorporate specific control measures that would be implemented in the field. ORNI 50, LLC has committed to implementation of PDM AQ-1 (see Section 4.2.2) to control fugitive dust; however, to strengthen the intent of PDM AQ-1 and to ensure that specific control measures would be implemented during construction that are at least as effective in controlling fugitive dust as was estimated in the emission calculations, **Mitigation Measure AQ-3** (see Section 4.2.9) is recommended.

Public Health Risk and Odors

Geothermal fluid can release various non-condensible gases such as H_2S. Hot water, steam, particulate, and/or gases that could emanate from a typical geothermal well during drilling, testing, and cleanout in the Casa Diablo Geothermal Resource Area could contain several minerals and other naturally occurring chemicals. However, most of these chemicals are present only in trace amounts and would not pose a health hazard to the surrounding environment. H_2S emissions would be the most important non-condensible gas from a health-risk and odor nuisance standpoint. The potential exists that this gas and other non-condensable gases may be emitted intermittently on a short-term and temporary basis during drilling.

During well cleanout and flow testing, geothermal fluids would likely be pumped into large tanks. H_2S may temporarily be released from the geothermal fluid for several hours to up to 30 days during these activities. The local H_2S emissions during these activities could exceed the GBUAPCD H_2S emissions standard of 2.5 kg/hr/source and could produce an objectionable "rotten egg" odor in the immediate vicinity of each well. However, these concentrations would not be expected to pose a health hazard and would not reach far beyond the vicinity of the well under normal conditions. Potential H_2S emissions resulting from these activities would be temporary at each well development site and would occur for a relatively short period of several hours to up to 30 days.

Upon Project approval the GBUAPCD would issue an Authority to Construction permit for well drilling activities that would require well site monitoring of H_2S as well as development of an H_2S abatement plan should levels temporarily exceed 2.5 kg/hr. To formalize this requirement for the purposes of this NEPA/CEQA review, **Mitigation Measure AQ-4** (see Section 4.2.9) is recommended.

Construction of the CD-IV Project would also result in short-term diesel exhaust emissions from on-site heavy duty equipment and from material deliveries and debris removal. Particulate exhaust emissions from diesel-fueled engines (i.e., DPM) were identified as a TAC by the CARB in 1998. Construction of the CD-IV Project would result in the short-term generation of DPM emissions from the use of off-road diesel equipment required for site preparation and well drilling activities, and from construction material deliveries and decommissioning material removal using on-road heavy-duty trucks.

The dose to which receptors are exposed is the primary factor affecting health risk from TACs. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. According to the Office of Environmental Health Hazard Assessment (OEHHA), health risk assessments, which determine the exposure of sensitive receptors to TAC emissions, should be based on a 70-year exposure period when assessing TACs (such as DPM) that have only cancer or chronic non-cancer health effects (OEHHA, 2003). However, such health risk assessments should be limited to the duration of the emission-producing activities associated with the project. For the CD-IV Project, the highest DPM emissions source would be the drill rig that would have engines that would operate at each site for a combined total of 16 hours per day, for a period of approximately 30 days at each well site. The total PM2.5 emissions from on-site preparation and drilling would be approximately 0.07 ton over the 2-month well development period at each well site.[2] Because these emissions would not occur in the immediate vicinity of a sensitive receptor, and because the duration of exposure would be a small fraction of the 70-year exposure period used in health risk assessments, the health risk from the short-term DPM emissions is expected to be negligible.

The closest sensitive receptor to a CD-IV Project site is the Shady Rest Campground, approximately 0.5 mile to the west-southwest of Well Site 38-25, and the closest residences are along Trails End Road, approximately 0.8 mile southwest of Well Sites 38-25 and 50-25. Therefore, given the temporary nature of construction activities and the lack of sensitive receptors in the immediate vicinity of CD-IV Project components, health risks and odor nuisances that would be associated with the CD-IV Project are expected to be negligible.

Operation and Maintenance

Criteria Pollutants

Table 4.2-4 shows the estimated annual criteria pollutant emissions that would be generated each year during operation and maintenance of the CD-IV Project. As shown in Table 4.2-4, there are no applicable General Conformity *de minimis* levels for ROG, NO_x, CO, or SO_2 because the GBVAB is in attainment of the federal AAQS for those pollutants and those pollutants have not recently exceeded the applicable federal AAQS. Therefore, there is little possibility that the Project-related emissions of ROG, NO_x, CO, or SO_2 could result in a violation of a federal AAQS. The operation and maintenance annual emissions for PM10 and PM2.5 would be below the respective NEPA *de minimis* level of 100 tons per year. Therefore, it can be concluded that operation and maintenance of the CD-IV Project would not result in or contribute to an exceedance of a federal AAQS.

Table 4.2-5 provides the estimated maximum day air pollutant emissions that would be generated within the GBVAB during long-term operation and maintenance associated with the CD-Project. As shown in Table 4.2-5, there are no applicable ICAPCD significance threshold for CO, SO_2, or PM2.5 because the GBVAB is designated as attainment of the state AAQS for those pollutants. Therefore, there is little possibility that the CD-IV Project-related operation and maintenance emissions of CO, SO_2, or PM2.5 could violate a state AAQS. The maximum day emissions of

[2] PM2.5 exhaust emissions are conservatively used here as a surrogate for DPM.

TABLE 4.2-4
PROPOSED ACTION ANNUAL OPERATION AND MAINTENANCE EMISSIONS

Emissions Source	Maximum Day Emissions (tons/year)[a]					
	ROG	**NO_x**	**CO**	**SO_2**	**PM10**	**PM2.5**
Power Plant Fugitive n-pentane[b]	74.8	---	---	---	---	---
Off-site Vehicle Emissions	<0.1	0.1	0.4	<0.1	<0.1	<0.1
Emergency Generator and Firewater Pump[c]	<0.1	0.2	0.0	<0.1	<0.1	<0.1
Total (maximum pounds/day)	**74.8**	**0.3**	**0.4**	**<0.1**	**<0.1**	**<0.1**
General Conformity *de minimis* Level (tons/year)	---	---	---	---	100	100

NOTES:

[a] Exhaust and fugitive dust emissions calculations and assumptions are provided in Appendix C.1.
[b] Obtained from MPLP, 2010.
[c] Obtained from Mono County, 2012.

SOURCES: MPLP, 2010; Mono County, 2012.

TABLE 4.2-5
PROPOSED ACTION MAXIMUM DAY OPERATION AND MAINTENANCE EMISSIONS

Emissions Source	Maximum Day Emissions (pounds/day)[a]					
	ROG	**NO_x**	**CO**	**SO_2**	**PM10**	**PM2.5**
Power Power Plant Fugitive n-pentane[b]	410.0	---	---	---	---	---
Off-site Vehicle Emissions	0.1	0.6	2.5	<0.1	<0.1	<0.1
Emergency Generator and Firewater Pump[c]	0.1	7.9	1.2	0.8	0.2	0.2
Total (maximum pounds/day)	**410.2**	**8.5**	**3.7**	**0.8**	**0.2**	**0.2**
ICAPCD Significance Thresholds (lbs/day)	75	100	---	---	150	---

NOTES:

[a] Exhaust and fugitive dust emissions calculations and assumptions are provided in Appendix C.1.
[b] Obtained from MPLP, 2010.
[c] Obtained from Mono County, 2012.

SOURCES: MPLP, 2010; Mono County, 2012.

ROG would easily exceed the respective ICAPCD significance threshold; therefore, it can be concluded that operation of the CD-IV Project could result in or contribute to an exceedance of the state 1-hour and/or 8-hour ozone AAQS. The estimated maximum day NO_x and PM10 emissions would not exceed the ICAPCD significance thresholds, indicating that Project-related NO_x and PM10 emissions would not result in an exceedance of the state PM10 24-hour AAQS.

As noted in Table 4.2-5, the ROG operation and maintenance emissions associated with the CD-IV Project would be almost exclusively related to fugitive n-pentane at the power plant. During major maintenance activities, n-pentane would be controlled and minimized by evacuating and compressing the n-pentane vapors, returning the n-pentane liquid to the OEC Unit and releasing the n-pentane vapors that would not condense through the n-pentane VRUs, which would adsorb nearly all of the remaining n-pentane vapors. The OEC VRUs at other facilities similar to what is proposed for the CD-IV Project have demonstrated better than 99.6 percent efficiency in controlling and recovering n-pentane emissions during normal operations (MPLP, 2010). The CD-IV Project would include state of the art equipment and best available technology designed to limit fugitive n-pentane emissions; therefore, there is no additional feasible mitigation that can be applied to the CD-IV Project to substantially reduce the long-term fugitive ROG emissions. However, **Mitigation Measures AQ-5 and AQ-6** is recommended to ensure that fugitive releases of n-pentane are limited to 410 pounds per day.

Public Health Risk and Odors

Because the closest residential sensitive receptors are located approximately 1.6 miles from the proposed power plant site, and the power plant would have negligible TAC emissions (see PM2.5 levels presented in Tables 4.3-4 and 4.3-5), the health risk from exposure to DPM during CD-IV Project operation and maintenance would be negligible. Odors would not be expected during normal operations because the geothermal fluid would be contained within a closed-loop heat exchanger system and reinjected back into the geothermal reservoir.

Decommissioning

At the end of the 30-year expected life of the CD-IV Project, operation would cease and associated facilities would be decommissioned and dismantled, and the site would be restored in conformance with BLM and USFS requirements. Decommissioning activities could generate temporary air pollutant emissions similar to those that would occur during construction of the power plant and pipeline (see Tables 4.2-2 and 4.2-3, above). It should be noted that decommissioning activities would not require drilling. Therefore, decommissioning activities would likely generate annual and maximum day emissions that would be below the federal *de minimis* levels and ICAPCD significance thresholds, and it can be concluded that decommissioning activities would not result in an exceedance of a federal or state AAQS.

4.2.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (construction, operation and maintenance, and decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.2.3.

a) Conflict with or obstruct implementation of the applicable air quality plan.

The Air Quality Management Plan for the Town of Mammoth Lakes was implemented in an attempt to bring the area into compliance with federal and state PM10 air quality standards. The plan adopted regulations that reduced emissions from reentrained road cinders, 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. The CD-IV Project would not include fires of any kind (see Section 2.2.8, DPM Haz-6). Emissions associated with reentrained road cinders are controlled by limiting peak vehicle miles travelled (VMT) to 106,600 on any given day. Based on trip and mileage data presented in Appendix C, operations of the CD-IV Project would only result in a total VMT of up to 140 each day, and construction would temporarily result in a total VMT of up to 8,460 per day. Only a small fraction of the CD-IV Project VMTs would occur within the Town. Therefore, it is unlikely that the CD-IV Project would conflict with or obstruct the Town's Air Quality Management Plan. There would be no impact.

b) Violate any air quality standard or contribute to an existing or projected air quality violation.

As shown in Table 4.2-3, the maximum daily CD-IV Project-related construction emissions of ROG and PM10 would be below the respective significance thresholds. Therefore, CD-IV Project emissions of ROG and PM10 would not result in or contribute to an exceedance of an applicable 1-hour, 8-hour, or 24-hour AAQS and the associated construction impacts would be less than significant. With regard to NO_x, the estimated maximum day emissions would exceed the CEQA significance threshold, indicating that CD-IV Project-related NO_x emissions could cause or contribute to an exceedance of the state ozone 1-hour or 8-hour AAQS. Implementation of Mitigation Measure AQ-1 would reduce emissions associated with off-road mobile diesel equipment; however, total maximum day emissions would still exceed the CEQA significance threshold. Therefore, the short-term construction-related NO_x impact would be considered significant and unavoidable.

The maximum day emissions that would be associated with operation and maintenance of the CD-IV Project would exceed the CEQA significance threshold for ROG, and would be below the CEQA significance thresholds for the other pollutants (see Table 4.2-5). Therefore, impacts associated with operation and maintenance of the CD-IV Project could result cause or contribute to an exceedance of the state ozone 1-hour or 8-hour AAQS. Because the CD-IV Project is proposed to include state of the art equipment and best available technology that would limit fugitive ROG (i.e., n-pentane) emissions, no additional feasible mitigation measures are available to further substantially reduce fugitive ROG emissions, and the CD-IV Project would result in a significant and unavoidable impact related to long-term fugitive emissions of n-pentane.

Decommissioning activities could generate temporary air pollutant emissions similar to those that would occur during construction of the power plant and pipeline (see Tables 4.2-2 and 4.2-3, above). Therefore, the proposed activities would likely generate annual and maximum day emissions that would be below the CEQA significance thresholds. Therefore, decommissioning activities that would be associated with the CD-IV Project would result in impacts that would be less than significant.

c) *Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).*

The CD-IV Project area is designated as non-attainment of the state 1-hour and 8-hour ozone AAQS, the state 24-hour PM10 AAQS, and the federal PM10 24-hour AAQS. Construction activities associated with the CD-IV Project could have a temporary impact on regional air quality through short-term increases in ROG, NO_x, and PM10, which could be cumulatively significant when combined with other projects described in Table 4.1-1. If a project would exceed the significance thresholds identified in Table 4.2-1, its emissions would be cumulatively considerable, and if a project would not exceed the significance thresholds, its emissions would not be cumulatively considerable.

As shown in Table 4.2-3, the maximum day construction emissions for NO_x would exceed the CEQA significance threshold; however, the maximum day emissions of ROG and PM10 would not exceed the CEQA significance thresholds. Implementation of Mitigation Measure AQ-1 would slightly reduce NO_x emissions; however, the maximum day emissions would still exceed the significance threshold. Therefore, the CD-IV Project would be cumulatively considerable with respect to short-term construction emissions of NO_x and the associated cumulative impact would be significant and unavoidable.

Long-term CD-IV Project operation and maintenance would result in negligible maximum day emissions of NO_x and PM10 (see Tables 4.2-4 and 4.2-5); however, the maximum day emissions of fugitive n-pentane would easily exceed the CEQA significance threshold for ROG. Therefore, the CD-IV Project would be cumulatively considerable with respect to long-term emissions of ROG and the associated cumulative impact would be significant and unavoidable.

Decommissioning activities would generate temporary air pollutant emissions that would be below the CEQA significance thresholds. Therefore, the short-term decommissioning-related emissions would not be cumulatively considerable and the associated cumulative impact would be less than significant.

d) *Expose sensitive receptors to substantial pollutant concentrations.*

Given the temporary nature of CD-IV construction activities, the low levels of long-term TACs that would be generated, the lack of sensitive receptors in the immediate vicinity of CD-IV Project components, and the **Mitigation Measure AQ-4** requirements to conduct H_2S monitoring during well drilling and testing as well as implementation of a H_2S abatement plan if necessary, health risks to sensitive receptors would be negligible (see Section 4.2.4.1, above). The air quality impact of the CD-IV Project with respect to exposure of sensitive receptors to construction, operation and maintenance, and decommissioning-related emissions would be mitigated to less than significant.

e) Create objectionable odors affecting a substantial number of people.

During well cleanout and flow testing, H_2S may temporarily be released from the geothermal fluid for several hours to up to 30 days. The local H_2S emissions during these activities could produce a noticeable “rotten egg” odor (see Section 4.2.4.1). However, given the temporary nature of well cleanout and flow testing activities and the lack of sensitive receptors in the immediate vicinity of the proposed well sites, the CD-IV Project would not create odors that would affect a substantial number of people. The impact would be less than significant.

4.2.5 Alternative 2: Alternative Plant Site

4.2.5.1 Direct and Indirect Impacts

Construction and operation of the Alternative 2 power plant would result in the same air pollutant emissions as those identified in Tables 4.2-2 through 4.2-5. Therefore, same as for the Proposed Action, construction of Alternative 2 would result in the potential for short-term exceedances of the state ozone AAQS, operation and maintenance of Alternative 2 would result in the potential for long-term exceedances of the state ozone AAQS related to fugitive ROG (i.e., n-pentane) emissions, and decommissioning of Alternative 2 would not result in an exceedance of a federal or state AAQS.

However, under Alternative 2, the residence at Chance Ranch would be located approximately 0.5 mile from the power plant site, compared to approximately 1.6 miles under the Proposed Action. Although the Proposed Action would be preferred compared to Alternative 2 because the power plant site is closer to the residence at Chance Ranch under Alternative 2, the limited DPM emissions that would be associated with construction, operation and maintenance, and decommissioning of the power plant would result in negligible health risks related to DPM exposure for Alternative 2.

4.2.5.2 CEQA Significance Determination

Because emissions would be essentially the same for Alternative 2 compared with the Proposed Action, the CEQA significance determinations for Alternative 2 are the same as described above for the Proposed Action.

4.2.6 Alternative 3: Modified Pipeline Alternative

4.2.6.1 Direct and Indirect Impacts

Construction and operation of the modified pipeline under Alternative 3 would result in substantially the same air pollutant emissions as those identified in Tables 4.2-2 through 4.2-5. Therefore, same as for the Proposed Action, construction of Alternative 3 would result in the potential for short-term exceedances of the state ozone AAQS, operation and maintenance of Alternative 3 would result in the potential for long-term exceedances of the state ozone AAQS related to fugitive ROG (i.e., n-pentane) emissions, and decommissioning of Alternative 3 would not result in an exceedance of a federal or state AAQS.

Under Alternative 3, the geothermal production and injection pipeline route east of U.S. Highway 395 and north of Shady Rest Park would be modified. The Alternative 3 modified pipeline route east of U.S. Highway 395 would not be within the vicinity of any sensitive receptors; however, 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. Pipeline construction activities would proceed at a linear pace and would occur in the vicinity of the park for only a few days. Therefore, although the Proposed Action would be slightly preferred compared to Alternative 3 given the closer distance from the pipeline under Alternative 3 to Shady Rest Park, the limited DPM emissions that would be associated with construction, operation and maintenance, and decommissioning of the pipeline would result in negligible health risks related to DPM exposure.

4.2.6.2 CEQA Significance Determination

Because emissions would be essentially the same for Alternative 3 compared with the Proposed Action, the CEQA significance determinations for Alternative 3 are the same as described above for the Proposed Action.

4.2.7 Alternative 4: No Action

4.2.7.1 Direct and Indirect Impacts

Under the No Action Alternative, no drilling or construction activities associated with the CD-IV Project would occur, and as a result there would be no effects on air resources. The short-term construction and long-term operation air pollutant emissions described in Section 4.2.4 would not occur under the No Action Alternative; therefore, there would be no other impacts to air resources.

However, drilling of authorized geothermal exploration wells in Basalt Canyon, not associated with the CD-IV Project could continue, potentially resulting in short-term effects to air resources that have been disclosed in previous NEPA and CEQA documents.

4.2.7.2 CEQA Significance Determination

Under the No Action Alternative, no drilling or construction activities associated with the CD-IV Project would occur, and as a result there would be no effects on air resources.

However, drilling of authorized geothermal exploration wells in Basalt Canyon, not associated with the CD-IV Project could continue and the impacts from short-term well drilling-related pollutant levels could result in pollutant emissions that have been disclosed in previous NEPA and CEQA documents.

4.2.8 Cumulative Impacts

4.2.8.1 Geographic Extent/Context

The geographic scope considered for potential cumulative impacts to regional air quality is the GBVAB. If a project would result in an increase in a criteria pollutant, or criteria pollutant precursors, of more than the respective daily mass emissions thresholds, then it also would be considered to contribute considerably to a significant cumulative impact. Alternatively, if a project would not exceed the significance thresholds, its emissions would not result in an adverse cumulative effect. See Table 4.1-1 for a summary of all cumulative projects. Any construction project could contribute to regional air quality degradation.

With regard to impacts on sensitive receptors, the geographic scope considered for potential cumulative impacts on sensitive receptors are projects located within approximately 1,000 feet of the CD-IV Project that are also located within 1,000 feet of a sensitive receptor, such as a residence. The CD-IV Project would be constructed in a remote area of Mono County, where the closest sensitive receptors (i.e., campgrounds) would be at least 0.5 mile from any component of the CD-IV Project. No projects are identified in Table 4.1-1 that meet this criterion.

4.2.8.2 Existing Cumulative Conditions

The CD-IV Project area is designated as non-attainment of the state 1-hour and 8-hour ozone AAQS, the state 24-hour PM10 AAQS, and the federal PM10 24-hour AAQS. The proposed power plant site is in located at the Casa Diablo geothermal complex, which is currently developed with three geothermal power plants: MP-I, MP-II, and PLES-I. The CD-IV Project would constitute the fourth geothermal power plant in the complex.

4.2.8.3 Reasonably Foreseeable Projects

There are several projects in the vicinity of the CD-IV Project that are reasonably foreseeable and could be constructed and/or operated simultaneously with the CD-IV Project, including the MP-I Replacement Project, which would replace the aging MP–I power plant with a new, more modern and efficient binary power plant (M–1) while maintaining the existing geothermal wellfield, pipeline system and ancillary facilities. In addition to geothermal projects, there are numerous development projects in the GVAB region that would contribute to degradation of regional air quality. Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the project site and surrounding area that were used to develop this analysis of cumulative effects for air resources. Comparable data was available for the Snow Creek Master Plan, which proposes the development of 850 residential dwelling units, 400 hotel rooms/ suites, and up to 75,000 square feet for non-residential uses on a total of approximately 237 acres.

4.2.8.4 Construction and Decommissioning

Construction of the CD-IV Project would not cause a substantial impact related to the generation of odors because well drilling construction activities would be intermittent and spatially dispersed, and associated odors would dissipate quickly from the well sites. Projects in the cumulative scenario are not expected to cause odors that would intermingle with those of the CD-IV Project.

Short-term construction and decommissioning of the CD-IV Project would cause emissions that would exceed the ICAPCD significance thresholds (see Section 4.2.4.1, *Direct and Indirect Impacts*). Cumulative impacts would occur from short-term construction-related NO_x emissions when combined with the construction-related impacts of the cumulative projects described in Table 4.1-1, to the extent such projects would be constructed concurrently with the CD-IV Project. Mitigation Measure AQ-1 would reduce emissions of NO_x during CD-IV Project construction activities, but the short-term impacts related to NO_x would remain. Therefore, concurrent construction of the Proposed Action and the cumulative projects listed in Table 4.1-1would increase the likelihood that the state ozone AAQS would be exceeded. Table 4.2-6 summarizes the proposed CD-IV Project emissions along with available emissions data for cumulative projects listed in Table 4.1-1. The timing for these projects is unknown; therefore, emissions may not occur simultaneously.

TABLE 4.2-6
CUMULATIVE MAXIMUM DAY CONSTRUCTION EMISSIONS

Project	Maximum Day Emissions (pounds/day)					
	ROG	NO_x	CO	SO_2	PM10	PM2.5
CD-IV Project[a]	25	343	292	1	98	24
MP-I Replacement[b]	11	85	52	<1	13	9
Snow Creek Phase III Building and Construction[c]	287	186	257	<1	7	NA[d]
ICAPCD Significance Thresholds (lbs/day)	75	100	---	---	150	---

NOTES:
a Exhaust and fugitive dust emissions summaries and calculations and assumptions for the proposed CD-IV Project are provided in Table 4.2-3 and Appendix C.1, respectively.
b Mono County, 2012.
c Town of Mammoth Lakes, 2007.
d PM2.5 data is not available for this project.

4.2.8.5 Operation and Maintenance

Long-term operation and maintenance of the CD-IV Project would cause emissions that would exceed the ICAPCD significance thresholds (see Section 4.2.4.1, *Direct and Indirect Impacts*). Cumulative impacts would occur from long-term operation and maintenance-related fugitive ROG emissions and associated cumulative impacts when combined with the emissions-related impacts of the cumulative projects described in Table 4.1-1. The CD-IV Project’s operation and maintenance-related ROG emissions and the ROG emissions of cumulative projects could increase the likelihood that the state ozone AAQS would be exceeded. However, it should be noted that the operations of the proposed MP-I Replacement Project would result in less fugitive ROG emissions than current conditions at the aging MP-I power plant Table 4.2-7 summarizes the proposed CD-IV Project emissions along with available operation and maintenance emissions

TABLE 4.2-7
CUMULATIVE MAXIMUM DAY OPERATION AND MAINTENANCE EMISSIONS

Emissions Source	Maximum Day Emissions (pounds/day)[a]					
	ROG	NO_x	CO	SO_2	PM10	PM2.5
CD-IV Project[a]	410.2	8.5	3.7	0.8	0.2	0.2
MP-I Replacement[b]	-294.8[d]	0.12	1.19	7.91	0.84	NA
Snow Creek Operation and Maintenance[c]	170.10	145.55	1,326.47	0.95	NA	NA
ICAPCD Significance Thresholds (lbs/day)	75	100	---	---	150	---

NOTES:
[a] Emissions summaries and calculations and assumptions for the proposed CD-IV Project are provided in Table 4.2-5 and Appendix C.1, respectively.
[b] Mono County, 2012.
[c] Town of Mammoth Lakes, 2007.
[d] Net reduction in ROG compared to the old MP-I plant after taking reduction in fugitive n-pentane emissions into account.

data for cumulative projects listed in Table 4.1-1. The timing for these projects is unknown and therefore emissions may not occur simultaneously.

4.2.8.6 CEQA Significance Determinations

Under CEQA, the cumulative impacts related to short-term emissions of NO_x and operational fugitive emissions of ROG would be significant and unavoidable, and cumulatively considerable. Therefore, when considered together with the emissions of other projects, the Project-specific impact under CEQA would be cumulatively considerable and the cumulative impact would be significant and unavoidable.

4.2.9 Mitigation Measures

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 require that all drill rig engines meet either USEPA and CARB Tier 2 or higher emissions standards for off-road engines. Prior to commencement of drilling, ORNI 50, LLC shall provide documentation to GBUAPCD that demonstrates that each drill rig will be equipped with Tier 2 and Tier 3 engines.

Mitigation Measure AQ-3: 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:

- All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized to control dust emissions using water.
- 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.
- Limit traffic speed on unpaved access roads to 15 mph and post visible speed limit signs at construction site entrances.
- Suspend excavation and grading activity when gusts produce wind speeds exceeding 20 mph.
- Reduce land disturbance activities as much as possible so that natural, stable soil conditions remain.
- The plan shall include provisions for monitoring fugitive dust based on the requirements of PDM AQ-1, and if the requirements identified in PDM AQ-1 are exceeded, construction activities shall cease until it can be determined that the requirements can be achieved.

Mitigation Measure AQ-4: ORNI 50, LLC shall monitor H_2S concentrations during all well drilling and testing at GBUAPCD-approved locations for each well location. If the well H_2S emissions exceed 2.5 kg/hr or the State's H_2S ambient air quality standard for one hour is exceeded, further venting will be curtailed until an H_2S abatement plan, approved by the GBUAPCD, is implemented to reduce H_2S well emissions below 2.5 kg/hr and the ambient concentrations below the State standard of 0.03 parts per million. The plan shall include (1) a description of the abatement technology, the degree of control expected from such technology, and the test data indicating that such degree of control can be expected in a geothermal well application; and (2) air quality analysis showing that the use of such abatement technology will not result in any violation of the State ambient air quality standard for H_2S.

Mitigation Measure AQ-5: ORNI 50, LLC shall prepare and implement an Emission Management Plan for review and approval by the GBUAPCD Air Pollution Control Officer, which shall contain the following:

- A description of the method to determine the daily n-pentane volume in the plant.
- An explanation of how to calculate n-pentane loss rates over a given period.
- An action plan for detecting and reporting breakdown events under GBUAPCD Rule 403.B, when n-pentane leaks emit more than 410 pounds per day.
- An action plan for repairing leaks associated with breakdown events. A maintenance plan for routine monitoring and prevention of n-pentane leaks.
- A format for quarterly reports on n-pentane losses and purchases. The Emissions Management Plan shall be updated as necessary in order to ensure compliance with federal, state, and/or district rules and to incorporate management plan improvements if necessary.

Mitigation Measure AQ-6: ORNI 50, LLC shall obtain a portable Volatile Organic Compound (VOC) leak detector capable of meeting the performance specifications described in USEPA's Source Test Reference Method 21. This instrument shall be properly maintained, calibrated, and made readily available at all times on the property site. The instrument shall be used at least on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, and turbine gland seals. Whenever a leak is detected that is greater than 10,000 ppmv from any aforementioned equipment, ORNI 50, LLC shall initiate repairs as soon as practical. Once a leak is discovered, ORNI 50, LLC shall tag and log its location, record the leak concentration, record the date, and record the dates of each repair attempt. A report that includes the six-month average daily emission calculations and n-pentane purchases shall be submitted electronically to the GBUAPCD within 30 days from the end of each calendar quarter. A summary record of the leak repairs made shall also be submitted to the GBUAPCD when reporting n-pentane losses.

4.2.10 Residual Impacts after Mitigation Incorporated

There would be a residual substantial and significant unavoidable impact related to short-term construction emissions of NO_x and long-term operation emissions of fugitive ROG (i.e., n-pentane) after mitigation has been incorporated.

4.3 Biological Resources – Vegetation

4.3.1 Methodology for Analysis

This analysis of potential impacts of the Proposed Action and Alternatives to vegetation resources relies on a literature review, biological reconnaissance survey and coordination with appropriate permitting agencies including the USFWS and CDFW. A literature review was conducted to determine the federal and state-listed endangered, threatened, rare, and special-status plant species that have potential to occur within the Project vicinity. The literature review included a search of the CNDDB Electronic Inventory for the nine USGS 7.5' topographic quadrangles that surround the CD-IV Project as well as a review of the USFWS List of Federal Endangered and Threatened Species that may be Affected by Projects in Mono County, CA. Literature related to BLM- and USFS-listed Sensitive species and noxious weeds was also reviewed. Impacts are identified and evaluated based on relevant BLM and Forest Service standards, policies, and guidelines. 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 Associate, 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).

This section analyzes potential impacts to vegetation resources from construction, operation and maintenance, and decommissioning. This analysis addresses potential direct, indirect, and cumulative impacts of the CD-IV Project to special-status plant species, sensitive natural communities and other vegetation resources.

Direct impacts are those resulting from the CD-IV Project and occur at the same time and place. Indirect impacts are caused by the CD-IV Project, but can occur later in time or farther removed in distance while still reasonably foreseeable and related to the proposed action. The potential impacts discussed in this analysis are those most likely to be associated with CD-IV Project construction, operation and maintenance, and decommissioning. Impact analyses typically characterize effects to plant communities as temporary or permanent, with a permanent impact referring to areas that are developed or otherwise precluded from restoration to a pre-project state.

4.3.1.1 Native Vegetation Communities

Vegetation communities in the study area include Jeffrey Pine forest, Sagebrush Scrub, Wright's Buckwheat Dwarf scrub, and Singleleaf Pinyon woodland. To determine the potential for construction and operations activities to cause direct effects on native vegetation communities, the proposed construction areas were compared with maps of vegetation communities. Potential indirect effects on native vegetation communities were identified through the same means.

4.3.1.2 Federal and State Jurisdictional Wetlands and Waters of the U.S.

To determine the potential for construction and operations activities to cause direct effects on federal and state jurisdictional wetlands and waters of the U.S. the proposed construction areas were compared with maps of these features. Potential indirect effects were identified through the same means.

4.3.1.3 Special-Status Plants

Special-status plants in the study area include documented populations of pine fritillary. To determine the potential for construction and operations activities to cause direct effects on special-status plants, the proposed construction areas were compared with maps of these species. Potential indirect effects were identified through the same means.

4.3.1.4 Invasive Weeds

Invasive weeds in the study area include black mustard, cheatgrass, bull thistle, orchardgrass, tansy mustard, red-stem filaree, curly dock, Russian thistle, and common mullein. Construction and operation methods were examined to determine the potential for these activities to lead to the spread of these species.

4.3.2 Project Design Measures

The analysis assumes that the following PDMs related to vegetation resources are fully implemented:

Biological Resources

1. *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**)[1] may be applied to enhance areas to be reclaimed by revegetation.

[1] See Section 4.3.9 below for all mitigation measures.

Noxious Weeds

2. *BIO-3*: 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 equipment area at the ORNI 50, LLC equipment area at Casa Diablo on private land, or at a location approved by the authorized officer.

3. *BIO-4*: 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.

4. *BIO-5*: 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. (This measure is supplemented by **Mitigation Measure VEG-2** – see Section 4.3.9 below)

5. *BIO-6*: 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 a 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.

6. *BIO-7*: 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.

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 LRWQCB and USFS best management practices to prevent soil erosion, including the preparation of a SWPPP.

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.

4.3.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to biological resources if it would:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

e) Conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance; or

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

Only those CEQA significance criteria related to vegetation, riparian habitat, sensitive natural communities, and state and federal jurisdictional areas (i.e., criteria a, b, c and e) are addressed in this section. Those criteria with aspects that pertain to wildlife resources, which include criteria a, d, e, and f, are analyzed in Section 4.4, *Biological Resources – Wildlife*.

The Project site is not located in an area covered by an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan, so Significance Criteria (f) is not addressed further in the impact analysis presented in this section.

4.3.4 Alternative 1: Proposed Action

4.3.4.1 Direct and Indirect Impacts

Potential direct impacts on vegetation include disruption, trampling, or removal of rooted vegetation resulting in a reduction in the total acres of native vegetation and actions that unequivocally cause a reduction of total numbers of plants and/or reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts also could include decreased plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Indirect impacts can occur later in time or be farther removed in distance while still being reasonably foreseeable and related to the Project. Potential indirect impacts of the CD-IV Project include the introduction of invasive species by various vectors or conditions that compete with native species and can result in habitat degradation.

Native Vegetation Communities

Construction

Construction activities associated with the Proposed Action would result in direct temporary and permanent losses of native vegetation. These losses would occur through vegetation clearing, grading, or other surface disturbance (e.g., driving over vegetation). Jeffrey Pine Forest and Sagebrush Scrub are the dominant native vegetation communities in the study area. The Project site also supports smaller areas of Wright's Buckwheat Dwarf Scrub and Singleleaf Pinyon Woodland along with mechanically and thermally disturbed areas. Direct impacts to these communities include the permanent loss of native plant communities and fragmentation from adjacent or nearby native vegetation communities. Other temporary indirect impacts from the Proposed Action could occur to surrounding vegetation communities from grading activities disturbing soils and creating air-born, fugitive dust, which may disrupt photosynthesis and other metabolic processes, or sedimentation to or erosion of vegetated areas. The vegetation community at the proposed power plant and substation site is approximately 100 percent Jeffrey pine forest. Construction of the power plant would require removal of up to 6.5 acres of trees and other vegetation. An additional 0.25 acres would be cleared for construction of the substation. The transmission line connection from the power plant substation to the existing SCE Casa Diablo Substation would be 649 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 (maximum of 0.75 acres). The transmission line would be supported by 3 to 6 wooden poles, approximately 40 feet high. No new access roads would be required for the CD-IV power plant site.

Up to 16 production and injection wells are proposed in 18 potential well locations. 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. During construction, each well site would be approximately 2.5 acres to provide access for drilling equipment, mud pits, and a containment basin for drill cuttings. New well pads would require vegetation clearing, earthwork, drainage, and other improvements necessary for efficient and safe operation and fire prevention within an approximately 2.5 acre area for construction. The permanent disturbance area would be approximately 0.4 acres for the finished well pad. Clearing would include removal of organic material, trees, stumps, brush, and slash. If all 16 wells are required, 40 acres of vegetation would be cleared during well construction. Of these 40 acres, 33.6 acres would be restored following construction, leaving 6.4 acres permanently cleared of vegetation. Vegetation communities cleared for well construction would consist of either Jeffrey pine forest or Sagebrush Scrub (see

Table 3.3-1). Short permanent access roads from existing roads to the actual well sites would be constructed 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. An estimated 4,072 linear feet (1.4 acres of area) of new access roads would be constructed. Construction of these access roads would be accomplished by clearing brush and grading the surface to construct a roadway; gravel may be added where needed.

No new permanent access roads will be constructed for maintenance of the pipelines. 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. 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.

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 wide, although expansion joints/loops may have a wider corridor. Few, if any, trees likely would be cut or removed during construction of the pipeline in the Jeffrey Pine Forest plant community. Only in the densest areas would individual trees need to be removed to create the construction 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. 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 total alignment for the Proposed Action would total approximately 5.68 miles, of which up to 3.5 miles could consist of double pipeline (this equates to a total of 9.2 miles of pipeline placed along 5.68 miles of alignment).

Impacts to vegetation would occur almost entirely in the Jeffrey Pine Forest and Sagebrush Scrub communities, with additional impacts in the mechanically and thermally disturbed areas. Jeffrey Pine Forest and Sagebrush Scrub are common in the Project vicinity. Project activities would not impact the Wright's Buckwheat Dwarf Scrub or the Singleleaf Pinyon Woodland communities.

Tables 4.3-1 and 4.3-2 present a comparison of the three actions alternatives' potential construction impacts to native plant communities.

The CD-IV Project includes several PDMs aimed at protecting and reducing impacts to vegetation resources. PDM BIO-3 includes post-construction revegetation of areas not needed for operation of the Project. PDM HYD-6 protects vegetation along pipeline routes by prohibiting clearing and grading to minimize soil disturbance. Indirect impacts to surrounding vegetation communities from grading activities disturbing soils and creating air-born, fugitive dust would be reduced by implementation of PDM HYD-4 which requires watering of exposed soils in construction areas to minimize erosion and dust.

TABLE 4.3-1
ACRES OF VEGETATION DISTURBED (acres)[a]

	Alternative 1 – Proposed Action	Alternative 2 – Plant Site Alternative	Alternative 3 – Modified Pipeline Alternative
Power Plant Site (permanent)	6.5 acres	7.3 acres	6.5 acres
Substation (permanent)	0.25 acres	0.25 acres	0.25 acres
Transmission Line (Estimated 50 feet wide corridor) (permanent)	0.75 acres	5.61 acres	0.75 acres
Geothermal Pipeline (temporary) (Estimated 40 feet wide corridor)	27.5 acres	26.9 acres	26.3 acres
Geothermal Pipeline (permanent)	pipeline piers and footings only	pipeline piers and footings only	pipeline piers and footings only
Well Field (temporary)	33.6 acres	33.6 acres	33.6 acres
Well Field (permanent)	6.4 acres	6.4 acres	6.4 acres
Well Field Access Roads (permanent)	1.4 acres	1.4 acres	1.4 acres
Total Acres Disturbed (Temporary)	**61.1 acres**	**60.5 acres**	**59.9 acres**
Total Acres Disturbed (Permanent)	**15.3 acres**	**20.96 acres**	**15.3 acres**

NOTE:
[a] Estimated Acreages

TABLE 4.3-2
VEGETATION COMMUNITIES DISTURBED (acres)[a]

Vegetation Community	Alternative 1 – Proposed Action	Alternative 2 – Plant Site Alternative	Alternative 3 – Modified Pipeline Alternative
Jeffrey Pine Forest	36.86 acres	36.50 acres	36.24 acres
Sagebrush Scrub	39.56 acres	44.96 acres	38.96 acres

NOTE:
[a] Estimated Acreages

In addition to the implementation of PDMs protecting native vegetation communities, impacts to native vegetation communities would be reduced through the implementation of **Mitigation Measures VEG-1 and VEG-2**, which identify measures to avoid, reduce, or mitigate impacts to native vegetation communities.

Operation and Maintenance

As with construction, use and maintenance/plowing of access roads during O&M activities for the Proposed Action could result in indirect impacts to vegetation communities as a result of dust and surface disturbance.

Decommissioning

At the end of power plant operations, the CD-IV Project would prepare and implement a Site Abandonment-Reclamation Plan in conformance with BLM and USFS requirements. The Plan would describe the proposed equipment dismantling and site restoration program in conformance with the USFS requirements in effect at the time of abandonment. Decommissioning is anticipated to only directly affect areas that were previously disturbed during installation of the facilities. Thus, the direct removal of native vegetation communities is not anticipated for decommissioning activities.

Federal and State Jurisdictional Areas

Construction

Direct impacts to potentially jurisdictional features in the study area, including jurisdictional waters of the U.S., are not expected. Project facilities were located and designed to avoid direct impacts to wetlands and waters of the U.S. A number of pipeline corridors do cross potentially jurisdictional wetlands and waters of the U.S. in the vicinity of the existing Casa Diablo facility (see Figure 3.3-3). However, pipelines in these areas will span all potentially jurisdictional features and no supporting structures will be placed within potentially jurisdictional features. This will avoid any direct impacts to those features. RCAs in the study area will be avoided to the extent feasible through implementation of Mitigation Measure SW-7.

Construction of the Project facilities near potentially jurisdictional features may result in a discharge of sediments downstream of these sites. Increased sedimentation to these features could lead to decreases in water quality and subsequent impacts to the biological community dependent on these features. Implementation of PDM HYD-1 would reduce these indirect impacts to potentially jurisdictional features. PDM HYD-1 would require appropriate erosion control measures and USFS best management practices to prevent soil erosion, including the preparation of a Storm Water Pollution Prevention Plan.

Operation and Maintenance

No direct impacts are expected to federal and state jurisdictional areas from operation and maintenance of the power plant and facilities. As with construction, maintenance/plowing of access roads during O&M activities for the Proposed Action could result in indirect impacts to federal and state jurisdictional areas as a result of erosion.

Decommissioning

Decommissioning is anticipated to only directly affect areas that were previously disturbed during installation of the facilities. Thus, impacts to federal and state jurisdictional areas are not anticipated for decommissioning activities.

Special-Status Plants

Construction

No federal or state-listed plant species occur within the study area, and so none would be affected. Permanent direct impacts would occur to one non-listed special-status plant species that is documented in the study area, pine fritillary (CNPS Rare Plant Rank 4.3). The proposed action could affect populations at Well Pad sites 77-25 and 66-25. As the species is somewhat cryptic, it is possible that more plants are present and that the populations extend into adjacent similar forest habitat.

Direct impacts to pine fritillary include the loss of plants during site grading, accidental crushing of plants during construction including during site clearing and grubbing, and from vehicle staging atop plant populations. There is an additional chance that new special-status plant populations, likely of the species already identified on-site, could be located on the Project site or linear corridors prior to construction. If present, these populations also could be directly affected. The CD-IV Project includes several PDMs aimed at protecting and reducing impacts to vegetation resources. PDM BIO-3 includes post-construction revegetation of areas not needed for operation of the Project. PDM HYD-6 protects vegetation along pipeline routes by prohibiting clearing and grading to minimize soil disturbance.

Because pine fritillary is a CNPS Rare Plant Rank 4 species, no additional mitigation measures are necessary for impacts to this species. CNPS Rare Plant Rank 4 species constitute a watch list of plants of limited distribution or plants infrequent throughout a broader area in California. These plants receive no additional protection. Very few of the plants constituting CNPS Rare Plant Rank 4 meet the definitions of §1901, Chapter 10 (Native Plant Protection Act) or §2062 and 2067 (CESA) of the CDFG Code, and few, if any, are eligible for state listing.

Indirect impacts to special-status plants may occur within and outside the Project disturbance area during and following construction. Potential indirect effects to special-status plants include: facilitating the introduction and spread of non-native invasive plant species; fragmenting plant populations and potentially disrupting gene flow; disruption of pollinators; increased risk of fire; and disruption of photosynthesis and other metabolic processes from fugitive dust during construction and operation.

Indirect impacts to surrounding vegetation communities from grading activities disturbing soils and creating air-born, fugitive dust would be reduced by implementation of PDM HYD-4. The CD-IV Project includes several PDMs aimed at reducing impacts associated with noxious weed species (PDMs BIO-4, BIO-5, BIO-6, BIO-7, and BIO-8). The PDMs would help prevent new infestations from becoming established in the Project area and would help control the spread of existing populations.

Operation and Maintenance

As with construction, use of access roads and maintenance/plowing during O&M activities for the Proposed Action could result in indirect impacts to special-status plant species as a result of dust and disturbance.

Decommissioning

Decommissioning is anticipated to only directly affect areas that were previously disturbed during installation of the facilities. Thus, impacts to special-status plant species are not anticipated for decommissioning activities.

Noxious Weeds

Construction

Invasive, noxious weeds are threats to vegetation resources. They can displace native plants (including special-status species that are present in the study area), increase the threat of wildfire, and supplant foods that are important to herbivorous species (including special-status species that are present in the study area). Vehicles and construction equipment are the primary conduits for the spread of many invasive, noxious weeds. Construction activities and soil disturbance associated with the Proposed Action could indirectly introduce new invasive, noxious weeds to the study area and could further spread invasive, noxious weeds that are already present in the study area.

The CD-IV Project includes several PDMs aimed at reducing impacts associated with noxious weed species (PDMs BIO-4, BIO-5, BIO-6, BIO-7, and BIO-8). The PDMs would help prevent new infestations from becoming established in the Project area and would help control the spread of existing populations. This would be accomplished through prevention of introduction from outside seed sources (BIO-4, BIO-5), eradication of new non-native species populations (BIO-6), monitoring (BIO-7), and removal of cheatgrass in specific areas (BIO-8). **Mitigation Measure VEG-2** would also reduce impacts from noxious weeds by requiring the preparation of a comprehensive weed management plan.

Operation and Maintenance

The maintenance of access roads both within and outside the Project site boundary has the potential to introduce invasive plant species into disturbed areas and facilitate the spread of noxious weeds. Vehicles and crews inadvertently could track in clinging seeds and/or parts of noxious weeds, thus facilitating their spread. The application of PDMs BIO-4, BIO-5, BIO-6, BIO-7, and BIO-8 would reduce these impacts.

Decommissioning

As with construction, vehicles and construction equipment associated with decommissioning activities for the Proposed Action could indirectly introduce new invasive, noxious weeds to the study area and could further spread invasive, noxious weeds that are already present in the study area. The application of PDMs BIO-4, BIO-5, BIO-6, BIO-7, and BIO-8 would reduce these impacts.

4.3.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.2.2.

a) *Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.*

Construction

As described above, the Proposed Action is anticipated to result in temporary and/or permanent impacts to individuals or populations of pine fritillary observed within the survey area. These impacts, however, would not be significant. While this species have been identified as special-status, and the Proposed Action would impact it, the low level of impact would be *less than significant* and mitigation is, therefore, not required.

Operation and Maintenance

As described above, use and maintenance/plowing of access roads during O&M activities for the Proposed Action could result in indirect impacts to special-status plant species as a result of dust and disturbance. With implementation of PDM HYD-4, these impacts would be *less than significant*.

Decommissioning

Impacts to special-status plant species are not anticipated for decommissioning activities. Therefore, there is *no impact.*

b) *Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.*

Construction, Operation and Maintenance, and Decommissioning

The Proposed Action would not result in a significant impact to any sensitive vegetation communities/habitats or CDFW jurisdictional areas.

c) *Have a substantial adverse effect on federally protected wetlands as defined by §404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.*

Construction

As discussed above, direct impacts to potentially jurisdictional features in the study area, including jurisdictional waters of the U.S., are not expected. Construction activities may result in indirect impacts to features downstream of the study area. With implementation of PDM HYD-1, these impacts would be *less than significant*.

Operation and Maintenance

As discussed above, direct impacts to potentially jurisdictional features in the study area are not expected. Maintenance/plowing of roads may result in indirect impacts to features downstream of the study area. With implementation of PDM HYD-1, these impacts would be *less than significant*.

Decommissioning

The Proposed Action would not result in a significant impact to any federally protected wetlands during decommissioning.

e) Conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance.

Construction, Operation and Maintenance, and Decommissioning

The CD-IV Project would not conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, and it is consistent with the Conservation/Open Space Element of the Mono County General Plan and the Resource Management and Conservation Element of the Town of Mammoth Lakes General Plan.

4.3.5 Alternative 2: Plant Site Alternative

4.3.5.1 Direct and Indirect Impacts

Native Vegetation Communities

Potential impacts to native vegetation communities during construction, operation and decommissioning of Alternative 2 would be similar in nature as described for the Proposed Action, although impacts to specific community types would vary slightly. The total acreage of impacts to native vegetation communities would increase under Alternative 2 (see Table 4.3-1). Construction of the power plant under Alternative 2 would require removal of up to 7.3 acres of trees and other vegetation. An additional 0.25 acres would be cleared for construction of the substation. As in the Proposed Action, there would be no impacts to Wright's Buckwheat Dwarf Scrub, a community considered sensitive by the CDFW. The transmission line would require the removal of up to 5.61 acres of native vegetation (4,888 feet long by a maximum of 50 feet wide). 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 total alignment for Alternative 2 would total approximately 5.54 miles, of which up to 3.9 miles could consist of double pipeline (this equates to a total of 9.3 miles of pipeline placed along 5.54 miles of alignment). Impacts to native vegetation communities from construction of the well field and associated access roads would be the same as those described under the Proposed Action (6.4 acres of permanent disturbance for the well field and 1.4 acres for the associated access roads).

The types of impacts that would occur under Alternative 2 similarly would result in the direct and permanent loss of all vegetation communities within the disturbance footprint, and indirect impacts to vegetation resources would be similar to those discussed for the Proposed Action.

Implementation of PDMs designed to protect native vegetation communities would reduce potential impacts to vegetation communities, but impacts would not be completely avoided.

Federal and State Jurisdictional Areas

Potential impacts to federal and state jurisdictional areas during construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of PDMs designed to protect federal and state jurisdictional areas would reduce potential impacts to these areas, but impacts would not be completely avoided.

Special-Status Plants

Potential impacts to special-status plants during construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of PDMs designed to protect native vegetation communities would reduce potential impacts to special-status species, but impacts would not be completely avoided.

Noxious Weeds

Potential impacts from the introduction, establishment, and spread of noxious weeds during construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of PDMs that aim to prevent or minimize the introduction, establishment, and spread noxious weed species would reduce potential impacts, but impacts would not be completely avoided.

4.3.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts on vegetation resources of Alternative 2 would remain less than significant.

4.3.6 Alternative 3: Modified Pipeline Alternative

4.3.6.1 Direct and Indirect Impacts

Native Vegetation Communities

Potential impacts to native vegetation communities during construction, operation and decommissioning of Alternative 3 would be similar in nature, though of slightly less magnitude as described for the Proposed Action. The total acreage of impacts to native vegetation communities would decrease under Alternative 3 (see Table 4.3-1). Impacts to native vegetation from construction of the power plant, transmission line, well field, and well field access roads would be the same as described for the Proposed Action. The modification in pipeline corridor lengths would lead to slightly less disturbance and removal of vegetation as compared to the Proposed Action. 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 total alignment for Alternative 3 would total approximately 5.42 miles, of which up to 3.7 miles could consist of double pipeline (this equates to a total of 9.1 miles of pipeline placed along 5.42 miles of alignment).As in the Proposed Action, there would be no impacts to Wright's Buckwheat Dwarf Scrub, a community considered sensitive by the CDFW. The types of impacts that would occur under Alternative 3 similarly would result in the direct and permanent loss of all vegetation communities within the disturbance footprint, and indirect impacts to vegetation resources would be similar to those discussed for the Proposed Action. Implementation of PDMs designed to protect native vegetation communities would reduce potential impacts to vegetation communities, but impacts would not be completely avoided.

Federal and State Jurisdictional Areas

Potential impacts to federal and state jurisdictional areas during construction, operation and decommissioning of Alternative 3 would be the same as described for the Proposed Action. Implementation of PDMs designed to protect federal and state jurisdictional areas would reduce potential impacts to these areas, but impacts would not be completely avoided.

Special-Status Plants

Potential impacts to special-status plants during construction, operation and decommissioning of Alternative 3 would be similar in nature, though of slightly less magnitude as described for the Proposed Action. The reduction in pipeline corridor lengths would lead to slightly less disturbance and removal of vegetation as compared to the Proposed Action. Implementation of PDMs designed to protect native vegetation communities would reduce potential impacts to special-status species, but impacts would not be completely avoided.

Noxious Weeds

Potential impacts from the introduction, establishment, and spread of noxious weeds during construction, operation and decommissioning of Alternative 3 would be similar in nature, though of slightly less magnitude as described for the Proposed Action. Implementation of PDMs that aim to prevent or minimize the introduction, establishment, and spread noxious weed species would reduce potential impacts, but impacts would not be completely avoided.

4.3.6.2 CEQA Significance Determination

Despite the reduction in pipeline routes, the CEQA significance determinations for impacts of Alternative 3 to vegetation resources would be identical to those of the Proposed Action (less than significant).

4.3.7 Alternative 4: No Action

4.3.7.1 Direct and Indirect Impacts

Under this alternative, the BLM would not approve the proposed CD-IV Project. Direct and indirect impacts related to the construction, operation and decommissioning of the power plant or pipelines would not occur.

However, in Basalt Canyon up to 11 additional wells may be drilled for exploratory purposes, which were analyzed in previous NEPA documents, and are not part of the CD-IV Project, although they occur at the same potential well sites. However, the five potential additional wells (up to 16 for the Proposed Action) would not be constructed.

If Alternative 4 were implemented, no changes would be implemented on the power plant site and the existing environmental setting described in Draft EIS/EIR Chapter 3 would be maintained except for potential exploratory well construction in Basalt Canyon. As a no-development alternative, the No Action would result in no changes to conditions related to vegetation resources; therefore, no impact would occur.

4.3.7.2 CEQA Significance Determination

Alternative 4 would result in no impacts to vegetation resources.

4.3.8 Cumulative Impacts

4.3.8.1 Geographic Extent/Context

The geographic scope of vegetation resources impacts encompasses the plant habitats of affected species in the region, including Jeffrey pine forest, Sagebrush Scrub, single-leaf pinyon woodland, and Wright's buckwheat dwarf scrub, as well as aquatic habitat in the Mammoth Creek watershed and other downstream watersheds. The Project area is located within or adjacent to federal, state, and county lands that are largely undeveloped and support native vegetation communities. In addition, development associated with the Town of Mammoth Lakes abuts the study area to the south and east.

The analysis of cumulative effects considers a number of variables including geographic (spatial) limits, time (temporal) limits, and the characteristics of the resources being evaluated. The geographic scope of this analysis is based on the nature of the geography surrounding the Project area and the characteristics and properties of each resource. In addition, each project would have its own implementation schedule, which may or may not coincide or overlap with the CD-IV Project schedule. This is a consideration for short-term impacts from the CD-IV Project. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the CD-IV Project.

4.3.8.2 Existing Cumulative Conditions

Population growth and continuing development pressure in the Town of Mammoth Lakes and the region have brought about substantial changes to, and effects on, natural resources. Similarly, recreation, land management, and other land uses have led to comparable effects on natural resources. Consequently, modification, alteration, and/or destruction of vegetation, special status plant species, federal and state jurisdictional areas, and the proliferation of invasive, noxious weeds are occurring throughout the region. Future growth and development in the analysis area will likely continue these impacts.

Vegetation communities are largely similar in the analysis area and consist primarily of a variety of scrublands and singleleaf pinyon woodlands at lower elevations and coniferous forests at higher elevations. Occasional montane meadow habitats dot the higher elevations, with open grasslands occurring sporadically at lower elevations. Riparian woodlands occur along the wetter drainages. Potential federally jurisdictional wetlands and waters of the U.S. as well as CDFW jurisdictional habitats are limited in the study area; however, it is likely that jurisdictional habitats occur throughout the analysis area.

The study area supports one special status plant species, although the species is not federal or state listed. It is expected that the analysis area, particularly undeveloped lands, would also support some number of special-status plant species, some of which could be federal or state listed. In fact, the CNDDB shows a number of special-status species occurring in the analysis area.

Invasive, noxious weeds are present throughout the analysis area, although their numbers vary depending on the level of land disturbance. Cheatgrass, the most invasive, noxious weed found in the study area, has an overall Cal-IPC rating of high, and its level of invasiveness is ranked moderate (Table 3.3-1; Cal-IPC, 2006). This species may pose the biggest threat to vegetation resources in the analysis area.

4.3.8.3 Reasonably Foreseeable Projects

A wide variety of past, present, and reasonably foreseeable future development projects could contribute to the cumulative conditions for vegetation resources in the cumulative analysis area. Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the Project site and surrounding area and was used to develop this analysis of cumulative effects for vegetation resources. Most of these projects have either undergone independent environmental review pursuant to NEPA and/or CEQA or will do so prior to approval. Even if environmental review has not been completed for the cumulative projects described in Table 4.1-1, their effects were considered in the cumulative impacts analyses in this EIS/EIR.

Projects identified on the cumulative projects list on Table 4.1-1 that could result in cumulative vegetation impacts include:

1. MP-I Replacement Project
2. MP-II Project
3. PLES-I Project
4. New Airport Terminal
5. Waterford Bridges Project
6. Old Mammoth Place
7. Search and Rescue Facility
8. Snowcreek Master Plan
9. Mammoth View Project

4.3.8.4 Construction, Operations and Maintenance, and Decommissioning

Construction, operations and maintenance, and decommissioning activities would result in temporary and permanent losses of native vegetation. Despite measures to protect and remediate losses, construction of the CD-IV Project would cause both temporary (during construction from vegetation clearing) and permanent (displacement of vegetation with Project features such as the power plant site and well pad sites) impacts to vegetation communities as described in Section 4.3.4. Most of the projects identified in Table 4.1-1 also would result in temporary and permanent losses of native vegetation through grading and clearing activities to construct roads, utility infrastructure, and commercial, industrial, and residential developments. Permanent losses of vegetation associated with the Proposed Action combined with losses associated with past, present and future projects are considered significant. However, the CD-IV Project and the other projects would be required to mitigate impacts to sensitive vegetation communities. With implementation of such measures, the CD-IV Project's contribution to a significant cumulative impact to sensitive vegetation communities would be rendered less than cumulatively considerable.

As discussed above, impacts to one special-status plant species would result from implementation of project-related construction and decommissioning. However, these impacts would be less than significant and mitigation is, therefore, not required. Nevertheless, measures have been proposed to minimize the effects of the CD-IV Project to these sensitive plant species. The projects listed in Table 4.1-1 also would likely impact special-status plant species. As such, when combined with similar impacts of past and future projects, these incremental impacts would create a cumulative impact. However, the CD-IV Project's contribution to a significant cumulative impact to special-status plant species would be rendered less than cumulatively considerable.

Implementation of the CD-IV Project would not result in impacts to jurisdictional features and would therefore not contribute to an adverse cumulative effect.

As discussed above, the CD-IV Project's construction, operations and maintenance, and decommissioning activities would result in ground disturbance which has the potential to result in the introduction of invasive, non-native, and noxious plant species. Invasive, non-native, or noxious plant species exist within the analysis area as a result of natural events such as wildfires as well as from past and ongoing residential, commercial and industrial development. Many of the projects identified in Table 4.1-1 that would clear native vegetation would result in similar impacts. As such, when combined with similar impacts of past and future projects, these incremental impacts would create a cumulative impact. The implementation of PDMs would reduce impacts associated with noxious weed species (PDMs BIO-4, BIO-5, BIO-6, BIO-7, and BIO-8) and Mitigation Measures VEG-2 would also reduce impacts from noxious weeds by requiring the preparation of a comprehensive weed management plan. Based on the less than significant impact from CD-IV Project's contribution to invasive weeds, the CD-IV Project's contribution to a significant cumulative impact from the introduction and spread of invasive weeds would be rendered less than cumulatively considerable.

As discussed above, the CD-IV Project’s construction, operations and maintenance, and decommissioning activities could result in increased levels of airborne dust that may settle on surrounding vegetation. Increased levels of dust on plants can significantly impede the plants’ photosynthetic capabilities and degrade the overall vegetation community. CD-IV Project construction practices such as regular watering to control dust during clearing, grading, earth-moving, excavation, or other construction activities would reduce the amount of dust settling on surrounding vegetation. If construction from projects listed in Table 4.1-1 occurs at the same time as construction of the CD-IV Project, dust from these projects would combine to significantly impact plants’ photosynthetic capabilities and degrade the overall vegetation community. The likelihood that intensive dust generating activities of nearby projects would occur concurrently with those of the CD-IV Project is considered low. Therefore the potential for impacts of the CD-IV Project to combine with the impacts of the projects in Table 4.1-1 to result in a cumulative significant impact is also considered low.

4.3.8.5 CEQA Significance Determinations

As described above, the CD-IV Project’s contribution to a significant cumulative impact on sensitive vegetation communities, special-status plant species, the introduction and spread of invasive weeds, and dust-related impacts would be rendered less than cumulatively considerable and, therefore, not significant.

4.3.9 Mitigation Measures

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-2, ORNI 50, LLC shall prepare and implement a Revegetation Plan to restore all areas subject to temporary disturbance to pre-Project grade and conditions. The Revegetation Plan will not be implemented until it is approved by an Inyo NF botanist who is familiar with the project environment and the District Ranger. 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 personnel prior to installation.

6. ***Grazing.*** The USFS will ensure that grazing in the Sherwin/Deadman Sheep and Goat Allotment avoids active or revegetation monitoring areas in Basalt Canyon and Upper Basalt Canyon, as required by the Revegetation Plan (see **Mitigation Measure VEG-1.4, above).**

Mitigation Measure VEG-2: Weed Management Plan. ORNI 50, LLC shall implement a Weed Management Plan that meets the approval 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 Weed Management Plan shall include specific implementation requirements for each phase of the Project.

The Plan would be consistent with 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 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) 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 or visually verified increases occur that span two or more consecutive years of monitoring results collected at the end of the growing season.

   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 to eliminate new weed individuals prior to seed set. The early growing season for weedy annuals is February or March in the warmest zones of the thermally disturbed habitat, and from April to June outside of thermally disturbed habitat. 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 VEG-3: This mitigation measure shall modify PDMs BIO-5, BIO-6, and BIO-7: All weed monitoring and weed control remediation efforts shall commence at the start of construction activities and shall continue for the duration of the permit.

4.3.10 Residual Impacts after Mitigation Incorporated

Following implementation of mitigation measures provided in Section 4.3.9 as well as all suitable PDMs, all adverse impacts on vegetation resources resulting from construction, operations and maintenance, and decommissioning of the CD-IV Project and Alternatives would be avoided or substantially reduced.

4.4 Biological Resources – Wildlife

4.4.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts to general wildlife, special-status species, and mule deer migration. Impacts are identified and evaluated based on relevant BLM and Forest Service standards, policies, and guidelines. This analysis relies on a literature review, biological reconnaissance survey and coordination with appropriate permitting agencies including the USFWS and CDFW. A literature review was conducted to determine the federal and state-listed endangered, threatened, rare, and special-status plant species that have potential to occur within the Project vicinity. The literature review included a search of the CNDDB Electronic Inventory for the nine USGS 7.5’ topographic quadrangles that surround the Project (CDFW, 2012) and review of the USFWS *List of Federal Endangered and Threatened Species that may be Affected by Projects in Mono County, CA* (USFWS, 2012). Literature related to BLM- and USFS-listed Sensitive species was also reviewed. Studies and other information provided by ORNI 50, LLC also were reviewed, including the following:

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 (CD-IV) Geothermal Development Project (MACTEC Engineering, 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, 2011a);
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); and
7. Focused botanical surveys performed in 2008, 2009, and 2010 (Paulus, 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2010).

This section analyzes potential impacts to wildlife resources from CD-IV Project construction, operation and maintenance, and decommissioning. This analysis addresses potential direct, indirect, and cumulative impacts of the CD-IV Project to general wildlife, special-status species, and mule deer migration.

Direct impacts are those resulting from the CD-IV Project and occur at the same time and place. Indirect impacts are caused by the CD-IV Project, but can occur later in time or farther removed in distance while still reasonably foreseeable and related to the proposed action. The potential impacts discussed in this analysis are those most likely to be associated with CD-IV Project construction, operation and maintenance, and decommissioning.

4.4.1.1 General Wildlife and Habitat

This analysis evaluates the potential for implementation of the Proposed Action and Alternative to cause impacts to general wildlife and their habitats by comparing the proposed construction areas to maps of general wildlife habitats. In addition, construction and operation methods and activities were analyzed to determine what impacts their execution could have on general wildlife and their habitats.

4.4.1.2 Special-Status Species

Special-status wildlife with the potential to occur in the study area include northern goshawk, pallid bat, Townsend’s big-eared bat, western white-tailed jackrabbit, Sierra Nevada red fox, and Sierra marten. In addition, Owens tui chub and Owens sucker have the potential to occur immediately downstream of the study area. To determine the potential for CD-IV Project implementation to cause direct effects on special-status wildlife, the proposed construction areas were compared with maps of these species habitats. In addition, construction and operation methods and activities were analyzed to determine what impacts their implementation could have on special-status wildlife and their habitats.

4.4.1.3 Mule Deer Migration

Jim Paulus, Ph.D., conducted both resident and migratory deer surveys of the Casa Diablo, Basalt Canyon and Upper Basalt areas (Paulus, 2011a; Paulus 2012b) as well as a site specific migratory deer survey of the proposed M-I Replacement Project site (Paulus 2012a). The relevant findings of these surveys were integrated into the assessment of the impacts of the CD-IV Project on mule deer migration provided in this section.

4.4.2 Project Design Measures

The analysis assumes that the following PDMs related to biological resources are fully implemented:

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-3*: 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-4*: 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-5*: 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 (this measure is supplemented with **Mitigation Measure VEG-2**[1] in Section 4.3.9, *Biological Resources - Vegetation*).

6. *BIO-6*: 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 a 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-7*: 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.

Protection of Erosion and Surface Waters

8. *HYD-1*: Appropriate erosion control measures will be used to control any offsite discharges, and the Project will adopt any relevant LRWQCB and USFS best management practices to prevent soil erosion, including the preparation of a SWPPP.

9. *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.

10. *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.

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

[1] See Section 4.4.9 below for all mitigation measures.

Noise

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

13. *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.

4.4.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to biological resources if it would:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

e) Conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance; or

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

Only those CEQA significance criteria related to wildlife (i.e., criteria a, d, e, and f) are addressed in this section. Those criteria with aspects that pertain to vegetation, riparian habitat, sensitive natural communities, and state and federal jurisdictional areas, which include criteria a, b, c, and e, are analyzed in Section 4.3, *Biological Resources – Vegetation*.

The Project site is not located in an area covered by an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan, so Significance Criteria (f) is not addressed further in the impact analysis presented in this section.

4.4.4 Alternative 1: Proposed Action

4.4.4.1 Direct and Indirect Impacts

General Wildlife and Habitats

Construction

The permanent and temporary removal of habitat would have a direct effect on wildlife species through habitat loss (see below for separate discussions of impacts on special-status wildlife species and wildlife movement and breeding). Impacts include the permanent removal of 6.5 acres of habitat on the power plant site, as well as the installation of exclusion fence that would preclude most terrestrial wildlife species from using the power plant site. An additional 0.25 acres would be cleared at the site of the substation. The transmission line connection from the power plant substation to the existing SCE Casa Diablo Substation would be 649 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 (maximum of 0.75 acres). The transmission line would be supported by 3 to 6 wooden poles, approximately 40 feet high. No new access roads would be required for the CD-IV power plant site.

Up to 16 production and injection wells are proposed in 18 potential well locations. 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 Highway 395. During construction, each well site would be approximately 2.5 acres to provide access for drilling equipment, mud pits, and a containment basin for drill cuttings. New well pads would require vegetation clearing, earthwork, drainage, and other improvements necessary for efficient and safe operation and fire prevention within an approximately 2.5 acre area for construction. The permanent disturbance area would be approximately 0.4 acres for the finished well pad. Clearing would include removal of organic material, trees, stumps, brush, and slash. If all 16 wells are required, 40 acres of vegetation would be cleared during well construction. Of these 40 acres, 33.6 acres would be restored following construction, leaving 6.4 acres permanently cleared of vegetation. Vegetation communities cleared for well construction would consist of either Jeffrey pine forest or big sagebrush scrub (see Table 4.3-2 in Section 4.3, *Biological Resources - Vegetation*). Short permanent access roads from existing roads to the actual well sites would be constructed 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. An estimated 4,072 linear feet (1.4 acres of area) of new access roads would be constructed. Construction of these access roads would be accomplished by clearing brush and grading the surface to construct a roadway; gravel may be added where required for safety.

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 wide, although expansion joints/loops may have a wider corridor. Few, if any, trees likely would be cut or removed during construction of the pipeline in the Jeffrey Pine Forest plant community. Only in the densest areas would individual trees need to be removed to create the construction 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 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 total alignment for the Proposed Action would total approximately 5.68 miles, of which up to 3.5 miles could consist of double pipeline (this equates to a total of 9.2 miles of pipeline placed along 5.68 miles of alignment). The pipelines would include overpasses and underpasses to allow for wildlife movement across the pipeline corridors (these are discussed in more detail under **Mitigation Measure WIL-6**).

Impacts to wildlife habitat would occur almost entirely in the Jeffrey pine forest and big sagebrush scrub communities, with additional impacts in the mechanically and thermally disturbed areas. Jeffrey pine forest and big sagebrush scrub are common in the Project vicinity. CD-IV Project activities would not impact the Wright's buckwheat dwarf scrub or the singleleaf pinyon woodland communities. As shown in Table 4.3-2 (Section 4.3, *Biological Resources – Vegetation*), up to 36.86 acres of Jeffrey pine forest would be affected by Project implementation, but only 10.28 acres would be permanently encumbered by Project facilities. Similarly, up to 39.56 acres of big sagebrush scrub would be affected by Project implementation, but only 3.82 acres would be permanently encumbered by Project facilities. The CD-IV Project includes several PDMs aimed at protecting and reducing impacts to wildlife and their habitats. PDM BIO-2 includes post-construction revegetation of areas not needed for operation of the Project. PDM HYD-6 protects vegetation along pipeline routes by prohibiting clearing and grading to minimize soil disturbance.

Construction of the CD-IV Project would increase noise, night lighting, and fugitive dust that could disturb common and special-status wildlife species near the construction area. Many species are sensitive to visual and noise disturbances that could cause wildlife to alter foraging and/or breeding behavior and avoid suitable habitat in adjacent areas. Night lighting also could attract wildlife to the site, disrupting their normal pattern of behavior. During construction, nighttime task lighting would be used only as necessary. Excessive noise would be controlled through the implementation of PDM NOI-1 and NOI-2, which would reduce impacts to wildlife from noise disturbances. In addition, indirect impacts to wildlife from grading activities disturbing soils and creating air-born, fugitive dust would be reduced by implementation of PDM HYD-4.

As discussed in Section 4.3, *Biological Resources – Vegetation*, Project construction also has the potential to introduce invasive plant species outside of the Project site, which could result in the degradation of wildlife habitat outside of the power plant site and linear corridors. The CD-IV Project includes several PDMs aimed at reducing impacts associated with noxious weed species (PDMs BIO-3, BIO-4, BIO-5, BIO-6, and BIO-7). The PDMs will help prevent new infestations from becoming established in the Project area and will help control the spread of existing populations.

There is potential for wildlife to become trapped in lined well site basins. A lined well site basin is a temporary lined excavation used during the drilling and testing of each new well. Water can accumulate in the basin and attract rodents and other small terrestrial wildlife to the well site basin from which they cannot escape. The storage of water in lined wellfield basins would continue to attract wildlife and has the potential for similar impacts on wildlife as a result of the wellfield expansion associated with new geothermal development. The existing wellfield would be expanded by the addition of new wells and well sites to provide the additional geothermal fluid needed to support the proposed CD-IV power plant. This impact could be significant if future lined well site basins are constructed in a manner which prevents wildlife from escaping from the basins. The following impact mitigation measure is required for Mono County-approved projects and should be considered as a requirement by federal agencies as a stipulation for approval of geothermal projects on National Forest System land in the vicinity of Casa Diablo Hot Springs. To ensure that impacts to wildlife relative to lined well site basins are minimized fully, **Mitigation Measure WIL-2** will be implemented (see Section 4.4.9). **Mitigation Measure WIL-2** would require that water that may accumulate in geothermal well site basins during precipitation events is removed daily. Alternatively, this mitigation would require the basins to be designed with earthen ramps that trapped wildlife could use to escape. This mitigation will prevent wildlife from becoming trapped in lined well site basins.

In addition to the implementation of PDMs protecting wildlife and their habitats, impacts to native habitats would be reduced through the implementation of **Mitigation Measures VEG-1 and VEG-2** (see Section 4.3.9, *Biological Resources – Vegetation*), which identify measures to avoid, reduce, or mitigate impacts to native vegetation communities.

Operation and Maintenance

Once construction of the Proposed Action is completed, noise and human activity are expected to be similar to pre-project conditions. There are three existing geothermal power plants in the vicinity of the proposed power plant site which currently produce ambient noise levels that are expected to be similar to the proposed power plant. The introduction of a new noise source at the proposed power plant site could disrupt wildlife in the general vicinity of the site. There are existing production wells in the Basalt Canyon area that are currently producing ambient noise. Levels associated with new production wells are expected to be similar to the existing wells. Production wells would have electric-powered pumps that would generate a steady hum in the immediate area around the well. Maintenance of the production wells and access roads will result in periodic increases in noise and disturbance levels. However, this is expected to be similar to pre-project conditions. Secondary noise and disturbance sources in the Project area include occasional off-road vehicles (e.g., four wheel drive vehicles, all terrain vehicles, motorcycles/dirt bikes, and snowmobiles) as well as an informal target shooting range to the northeast of the geothermal complex.

As discussed in Section 4.3, *Biological Resources – Vegetation*, the maintenance of access roads both within and outside the Project site boundary has the potential to introduce invasive plant species into disturbed areas and facilitate the spread of noxious weeds. Vehicles and crews inadvertently could track in clinging seeds and/or parts of noxious weeds, thus facilitating their spread. This could result in the degradation of wildlife habitat outside of the power plant site and linear corridors. The application of PDMs BIO-3, BIO-4, BIO-5, BIO-6, and BIO-7 would reduce these impacts.

The pipelines would be a physical obstruction that could impede wildlife movement. The pipeline would be constructed on supports that provide an average of 12 to 18 inches of clearance between the ground and the bottom of the pipeline. The overall outside diameter of the finished pipe would range from 12 to 28 inches. Therefore the minimum height of the top of the pipe would be approximately 24 inches from ground level and the maximum height would be approximately 46 inches from ground level. The pipeline also would be constructed with multiple below-ground crossings (of existing roadways). Most wildlife known to frequent the area (jackrabbits, cottontail rabbits, ground squirrels, least chipmunks, kangaroo rats and wood rats) would be easily able to cross under the pipeline. Adult deer would be able to jump over the pipeline (Paulus, 2011b), as is the case with the existing geothermal pipelines in the Casa Diablo area. However, young deer may not jump over the pipeline, and they typically require at least 16 inches clearance to go under a fence (Wyoming Game and Fish Department, 2011b). Although there would be numerous places where the pipeline would be at least 16 inches above the ground (as discussed above, the average ground clearance would range from 12 to 18 inches), application of PDM BIO-1 would ensure that the pipeline did not substantially impede the movement of deer and other wildlife. PDM BIO-1 would require annual surveys along pipeline routes to investigate for signs that the pipelines are impeding wildlife movement and to provide adequate clearance for migration if evidence of obstruction is found.

Transmission lines to be installed under the CD-IV Project would not pose an electrocution hazard to raptors or other perching birds because designs follow Avian Power Line Interaction Committee (APLIC) guidelines. To ensure that potential impacts are minimized fully, **Mitigation Measure WIL-9** will be implemented.

Geothermal fluids could be accidentally released to the environment as a result of spills on the well sites or power plants, pipeline rupture or uncontrolled releases from the wells ("well blowouts"). However, application of PDM HYD-8 through HYD-13 would ensure that any potential spills, leaks or ruptures would limit release of geothermal fluids to levels that would not adversely affect biological resources.

Decommissioning

Decommissioning is anticipated to only directly affect areas that were previously disturbed during installation of CD-IV Project facilities. Thus, the direct removal of wildlife habitat is not anticipated for decommissioning activities. Potential direct and indirect effects to wildlife populations during decommissioning are similar to those described for the construction phase of the CD-IV Project and include wildlife disturbance from noise, light, or dust, and the introduction of invasive plant species by various vectors. Revegetation of the site and removal of facilities would ultimately re-establish wildlife habitat in disturbed portions of the Project area.

Special-Status Species

The following paragraphs discuss the potential environmental consequences of the CD-IV Project on those listed and sensitive wildlife species identified in Section 3.4.1.4 as having either some potential habitat within the study area, or having some potential to be adversely affected by the Project.

Construction

Owens tui-chub. Construction of the Proposed Action would not result in impacts to Owens tui-chub or its habitat, which occur about 2 miles east of the Project site.

Owens sucker. Construction of the Proposed Action would not result in impacts to Owens sucker or its habitat, which occur about 2 miles east of the Project site.

Northern goshawk. The Jeffrey pine stands in the western portion of the study area around Shady Rest Park are suitable northern goshawk nesting and foraging habitat. Northern goshawk PACs have been established by the USFS under the SNFPA within these portions of the study area. Five known northern goshawk nest sites have been identified in this portion of the study area that are believed to be associated with one pair of goshawks which return seasonally. Northern goshawk calls and nest surveys were conducted during the spring/summer of 2010. No northern goshawk detections were made during the three survey periods, and no nest sites, whitewash or plucking posts were located during the nest surveys.

Under the Proposed Action, construction activities may result in some increased disturbance to goshawks such as displacement during foraging and or nesting. These impacts would be temporary and associated only with the northwest portion of the Project area (individual well pads require approximately 2 months to construct, and would be built during two June through November work periods). This area contains the Shady Rest Park, an area used for recreation which contributes existing noise disturbance. Goshawks nesting in suitable habitat outside of the study area could potentially forage and or roost in suitable habitat areas within the study area. An increase in disturbance associated with construction may result in disturbances to goshawk foraging patterns and/or juvenile dispersal patterns.

Under the Proposed Action, direct effects to goshawk habitat include the removal of trees to develop well pad sites and pipeline routes. Tree removal would be minimized to the amount necessary for construction. The Proposed Action would result in disturbance to approximately 36.86 acres of Jeffrey pine forest habitat, including the permanent (approximately 150-year) loss of approximately 10.28 acres. The behavior and local distribution of common prey species (e.g., rodents, passerine birds) could be temporarily affected by construction activities; this could influence foraging activities and patterns of northern goshawks. Potential disruptions of prey populations and foraging opportunities would occur locally and over short periods, and are therefore not likely to affect a significant portion of any individual's foraging range.

The Biological Evaluation (BE) for the CD-IV Project concluded that Project activities may affect an individual goshawk's ability to forage in the area of construction, primarily in the northwest portion, but are not likely to result in a trend toward Federal listing or loss of viability (AMEC E&I, Inc., 2012). To ensure that impacts to nesting northern goshawk are minimized fully, **Mitigation Measure WIL-1** (see Section 4.4.9) will be implemented. This mitigation measure would limit construction activities in suitable goshawk habitat to outside the breeding season (if feasible); alternatively, pre-construction surveys for nesting goshawk will be performed prior to the start of construction activities. If active nests are discovered, buffers would be established protecting the nesting goshawks from construction impacts. The potential exists that an inactive goshawk nest could be destroyed as a result of Project implementation, either before or after the breeding season.

A northern goshawk was recently observed to have perished in a lined geothermal well site basin. The subject basin was located in the Casa Diablo geothermal wellfield west of U.S. Highway 395. As discussed above, water can accumulate in the basin and attracted rodents and other small terrestrial wildlife to the well site basin from which they cannot escape. This can lead to other wildlife, including goshawk, getting trapped in the lined well basin site. This impact could be significant if future lined well site basins are constructed in a manner which prevents wildlife from escaping from the basins. The following impact mitigation measure is required for Mono County approved projects and should be considered as a requirement by federal agencies as a stipulation for approval of geothermal projects on National Forest System land in the vicinity of Casa Diablo Hot Springs. To ensure that impacts to goshawk relative to lined well site basins are minimized fully, **Mitigation Measure WIL-2** will be implemented. **Mitigation Measure WIL-2** would require that water that may accumulate in geothermal well site basins during precipitation events is removed daily, and monitored during spring months to ensure that water does not accumulate as the snow melts. Alternatively, this mitigation would require the basins to be designed with earthen ramps that trapped wildlife could use to escape. This mitigation will prevent wildlife from becoming trapped in lined well site basins.

Greater sage-grouse. The study area does not support suitable habitat for sage-grouse, as the sagebrush, and grassland understory in the Project area is generally located beneath Jeffrey Pine forest, or is located proximal to forested lands that grouse actively avoid. Relatively open, non-forested areas support marginal quality habitat due to the low density of sagebrush, the presence of interspersed Jeffrey pines and the lack of herbaceous cover. Sage-grouse typically prefer dense, contiguous stands of sagebrush with no forest overstory. Grouse have been observed within a 0.25-mile distance from the nearest Project element. However, this is a single observation from the 1980s, across the highway from the Project area. If birds are still using this area, they would be separated from impacts of the CD-IV Project by a four lane highway and are not likely to move toward the CD-IV Project due to lack of suitable habitat. Surveys for possible sage-grouse nest and lek sites were conducted in June 2010; however, no signs of sage-grouse were observed during these surveys. Habitat modifications, especially those associated with the U.S. Highway 395 and SR 203 corridors and the existing Casa Diablo Geothermal Complex, have reduced the likelihood that sage-grouse use the scrub habitats available in the study area. The highways and existing geothermal development are now significant barriers to emigration from the known local use areas.

Under the Proposed Action, no direct impacts to sage-grouse or their habitat are anticipated. In the unlikely case that sage-grouse are present at the time of construction, activities may result in some increased disturbance to sage-grouse such as displacement during foraging. However, direct effects to nesting sage-grouse are not expected because this species actively avoids the habitat types that are available in the Project area. Sage-grouse nest sites and leks were not detected during surveys for the CD-IV Project. The nearest active lek is over 1 mile from the Project area. While nesting typically occurs within 3.2 miles of a lek, nesting is not expected in the CD-IV Project area due to lack of suitable habitat.

Indirect impacts to sage grouse in the Project area could include the introduction and spread of invasive vegetation species and mitigations are in place to limit the spread of invasive species into grouse habitat. Also, the increased presence of trash and food sources could increase raven presence, which can lead to egg predation. This impact will be minimized by storing food and trash in a manner that it is not available to wildlife. Another indirect impact is the potential for transmission lines to increase habitat for avian predators. No structures are planned that will extend significantly above the forest, therefore no increase in avian predators are expected.

The Proposed Action is not expected to have significant direct, indirect or cumulative effects on greater sage-grouse habitat in the Project area. The permanent loss of approximately 3.82 acres of sagebrush habitat will not alter the existing bioregional trend for sagebrush habitat in the Project area nor will it lead to a change in the distribution of greater sage-grouse across the Sierra Nevada bioregion (MACTEC, 2010). No sage-grouse or sage-grouse nests or leks have been found or are expected within the study area and no residual impacts are anticipated to this species.

Pallid bat and Townsend's big-eared bat. Suitable Townsend's big-eared bat roosting habitats such as cliffs and caves are not found within the Project area. However, suitable pallid bat roosting habitat exists in the Jeffrey pine forest along the northern portion of the Project area. While focused bat surveys have not been performed in the Project area, no known bat roosts occur within or adjacent to the Project area. In the absence of focused surveys to establish the absence of pallid bats, roosting is presumed within suitable habitat. Thus, construction activities may result in direct effects to roosting pallid bats, including the removal of roosting sites. **Mitigation Measure WIL-8** will be implemented to reduce impacts to roosting pallid bats.

The habitats within the study area could be used for foraging habitat. The Proposed Action would result in disturbance of approximately 36.86 acres of Jeffrey pine forest habitat (including the permanent loss of approximately 10.28 acres), which is suitable foraging habitat for these bat species. Both bat species are nocturnal feeders. The Proposed Action would result in direct and indirect impacts to bat species if construction activities disrupt nocturnal foraging habits. Although the majority of construction and maintenance activities would occur during daylight hours, potential disturbance to bats would occur around well pads during the nighttime drilling activities. However, the Project site and surrounding area supports extensive suitable foraging habitats for these species and the potential disruption to foraging bats is expected to be minimal. The pipeline would not interfere with the species ability to forage.

The BE concluded that the CD-IV Project may affect individuals, but would not likely result in a trend toward federal listing or loss of viability for either species (AMEC E&I, Inc., 2012).

Western white-tailed jackrabbit. Suitable habitat is present in the study area. This species could potentially use the scrub habitats in the study area for burrowing and foraging. The availability of trees and other high perches for predators diminishes the value of this habitat for western white-tailed jackrabbit. Construction activities and the loss of a small amount of scrub habitat would not have a negative effect on this highly mobile species. Up to 39.56 acres of big sagebrush scrub would be affected by the Proposed Action, but only 3.82 acres would be permanently encumbered by Project facilities.

Sierra marten. Suitable marten habitat exists in the northwestern portion of the study area in the mixed conifer area of Jeffery pine. However, the majority of the Jeffrey pine stands within the study area 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 study area. However, the lack of dense, multi-storied, multi-species late seral conditions (abundant downed logs, snags and large diameter trees) make it unlikely marten use the area for denning, resting and/or sustained foraging, except for the northwestern portion of the study area. Marten presence in the area is expected to be infrequent and used primarily while traversing between areas of more suitable habitat. Based on these conditions, it is not anticipated that active den or resting sites would be affected by the Proposed Action.

The BE concluded that the CD-IV Project may affect individuals, but would not likely result in a trend toward federal listing or loss of viability (AMEC E&I, Inc., 2012). Similarly, the MIS Report concluded that the Proposed Action is not expected to have a significant direct, indirect or cumulative effect on Sierra marten habitat in the Project area. The Proposed Action would result in disturbance to approximately 36.86 acres of Jeffrey pine forest habitat, including the permanent (approximately 150-year) loss of approximately 10.28 acres. However, habitat losses will not alter the existing bioregional trend in the Project area nor will it lead to a change in the distribution of Sierra marten across the Sierra Nevada bioregion (MACTEC, 2010). Because the majority of the Jeffrey Pine Forest habitat within the study area is marginal quality for marten due to the relative lack of snags, downed logs and large trees, the BE recommended **Mitigation Measure WIL-3** to improve the quality of the habitat. Following implementation of this measure, there should be no residual impacts to American marten habitat from construction of the Proposed Action.

Sierra Nevada red fox. Although the Sierra Nevada red fox is associated with subalpine habitats above 5,000 feet in the Sierra Nevada range, little is known regarding their current range and distribution. The Project site does contain habitat suitable for this species, but the most recent confirmed sighting in the region was from 1987 and 1988, approximately 5 miles north and south of the Project area. Given its nature to avoid contact with humans, it is unlikely that construction related activities would pose a negative impact on this species. This species is readily habituated by human food; however, the implementation of **Mitigation Measure WIL-7c** reduces the potential for habituation related to Project activities. Habitat removal due to construction would not have an impact on Sierra Nevada red fox.

Migratory Birds. Habitats in the Project area such as Jeffrey pine forest and big sagebrush scrub provide suitable nesting and foraging habitat for migratory birds. The Proposed Action would result in direct and indirect impacts to nesting bird species protected under Fish and Game Code §§3503.5 and 3511, and the Migratory Bird Treaty Act. Under the Proposed Action, construction activities may result in some increased disturbance to migratory birds such as displacement during foraging and or nesting. Under the Proposed Action, direct effects to migratory bird habitat include the removal of trees and shrubs to develop the power plant, transmission line, substation, well pad sites and pipeline routes. Vegetation removal would be minimized to the amount necessary for construction. The Proposed Action would result in the disturbance of approximately 76.42 acres of potentially suitable habitat for migratory birds, including the permanent loss of approximately 15.3 acres. These disturbances could cause nest abandonment and death of young or loss of reproductive potential at active nests located in or near the study area. Impacts may occur through the removal of vegetation and/or through vehicle and foot traffic or excessive noise associated with construction. **Mitigation Measure WIL-1** will be implemented to reduce impacts to migratory and nesting birds. This mitigation measure would limit construction activities in suitable habitat to outside the breeding season (if feasible); alternatively, pre-construction surveys for migratory birds will be performed prior to the start of construction activities. If active nests are discovered, buffers would be established protecting the nesting birds from construction impacts.

Operation and Maintenance

Impacts from operation and maintenance of the Proposed Action to most special-status wildlife species are similar to those described for general wildlife species (see below for exceptions). Once construction of the Proposed Action is completed, noise and human activity are expected to be similar to pre-project conditions. There are three existing geothermal power plants in the vicinity of the proposed power plant site which currently produce ambient noise levels that are expected to be similar to the proposed power plant. There are existing production wells in the Basalt Canyon area that currently producing ambient noise. Levels associated with new production wells are expected to be similar to the existing wells. Maintenance of the production wells and access roads will result periodic increases in noise and disturbance levels. However, this is expected to be similar to pre-project conditions. Secondary noise and disturbance sources in the study area include occasional off-road vehicles (e.g., four wheel drive vehicles, all terrain vehicles, motorcycles/dirt bikes, and snowmobiles) as well as a target shooting range to the northeast of the geothermal complex.

As discussed in Section 4.3, *Biological Resources – Vegetation*, the maintenance of access roads both within and outside the Project site boundary has the potential to introduce invasive plant species into disturbed areas and facilitate the spread of noxious weeds. Vehicles and crews inadvertently could track in clinging seeds and/or parts of noxious weeds, thus facilitating their spread. This could result in the degradation of wildlife habitat outside of the power plant site and linear corridors. The application of PDMs BIO-3, BIO-4, BIO-5, BIO-6, and BIO-7 would reduce these impacts.

Owen's Tui Chub. There is no Owens tui chub habitat available in the study area. 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. Operation of the Proposed Action would increase the existing extraction of geothermal water from the Long Valley geothermal reservoir from additional deeper wells in Basalt Canyon. All of the produced fluid would be returned to the reservoir via reinjection. Because the geothermal reservoir has been shown to be connected to the surface waters and sensitive hot springs or other geothermal features in the south-southeastern caldera, these features, including the springs at the Hot Creek State Fish Hatchery, may be affected by the additional development of the geothermal reservoir. However, as described in Section 4.7, historical monitoring data, modeling forecasts, and temperature of thermal features suggest that little change to the quantity, quality or temperature of these geothermal features would occur under the Proposed Action.

Recent studies of spring flow, temperature and water chemistry at the Fish Hatchery have shown that minimal temperature changes have occurred in the mixed thermal and non-thermal warm springs in response to geothermal development at Casa Diablo. Changes in discharge occurred during 1984 and 1995 when alterations in the geothermal production scheme occurred at the same time that the region also experienced a long-term drought, which affected all parts of the hydrologic system. Total net changes in temperature at the two main Hot Creek Fish Hatchery springs during the most significant period of geothermal development at Casa Diablo (1988-2003) were less than 2ºF (1.1ºC). Although greater temporary temperature declines have occurred during this time period (approximately 4°F (2.2ºC) in 1995), these changes were apparently related to high winter precipitation, greater snow melt runoff, and higher than normal cold groundwater flow rates during the spring and summer. Furthermore, changes in hot spring inlet temperatures have not been accompanied by changes in chemistry of the water which would indicate a change in thermal inflow, suggesting that conductive heating in the rocks is buffering temperature of inflow to the springs. Thus it is difficult to identify the smaller effects of geothermal development on the Hatchery springs relative to natural climatic effects because climatic variations and geothermal reservoir changes have both occurred simultaneously. Hatchery spring temperatures are apparently buffered by conductive heat from hot rocks in the subsurface to water along the water’s flow path, thus buffering potential impacts on temperature from changes in thermal water discharge (EGS, 2012).

Although the CD-IV Project is forecast to reduce the thermal outflow to Hatchery Springs by about 17 percent, the thermal water fraction is a very small part (less than 5 percent) of the total flow so the forecast impact to the combined cold and thermal discharge at the springs is forecast to be reduced by less than 1 percent, which is not likely to be measureable relative to climatic effects. In addition, conductive buffering of the temperature would minimize potential temperature changes.

Operation of the Proposed Action has the potential to affect Owens tui chub habitat. As discussed above, increasing geothermal fluid production in the geothermal reservoir is not anticipated to cause adverse impacts such as reduced flows or substantial temperature changes to springs, surface waters, and other hydrologic surface features that could provide habitat, therefore adverse effects on the Owens tui chub and critical habitat are not expected. To ensure no adverse effects to the Owens tui chub or their critical habitat, **Mitigation Measure WIL-10** would be implemented. This mitigation requires baseline and ongoing studies to quantify current Owens tui chub habitat conditions and monitor populations in the AB and CD springs, and Little Hot Creek Pond. In addition, under PDM 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 KGRA. ORNI 50 LLC also commits to operating the proposed geothermal project in conformance with these requirements.

Owens Sucker. There is no available habitat for Owens sucker in the study area, though suitable habitat for this species exists downstream of the study area in Mammoth Creek, and this habitat may be impacted indirectly by the Project as described above for Owens tui chub. However, as described in Section 4.7, historical monitoring data, modeling forecasts, and temperature of thermal features suggest that little change to the quantity, quality or temperature of the hydrologic features that outflow to potential Owens sucker habitat would occur under the Proposed Action. Based on this assessment there would be no potential for adverse impacts on the Owens sucker or its habitat as a result of operation of the Proposed Action.

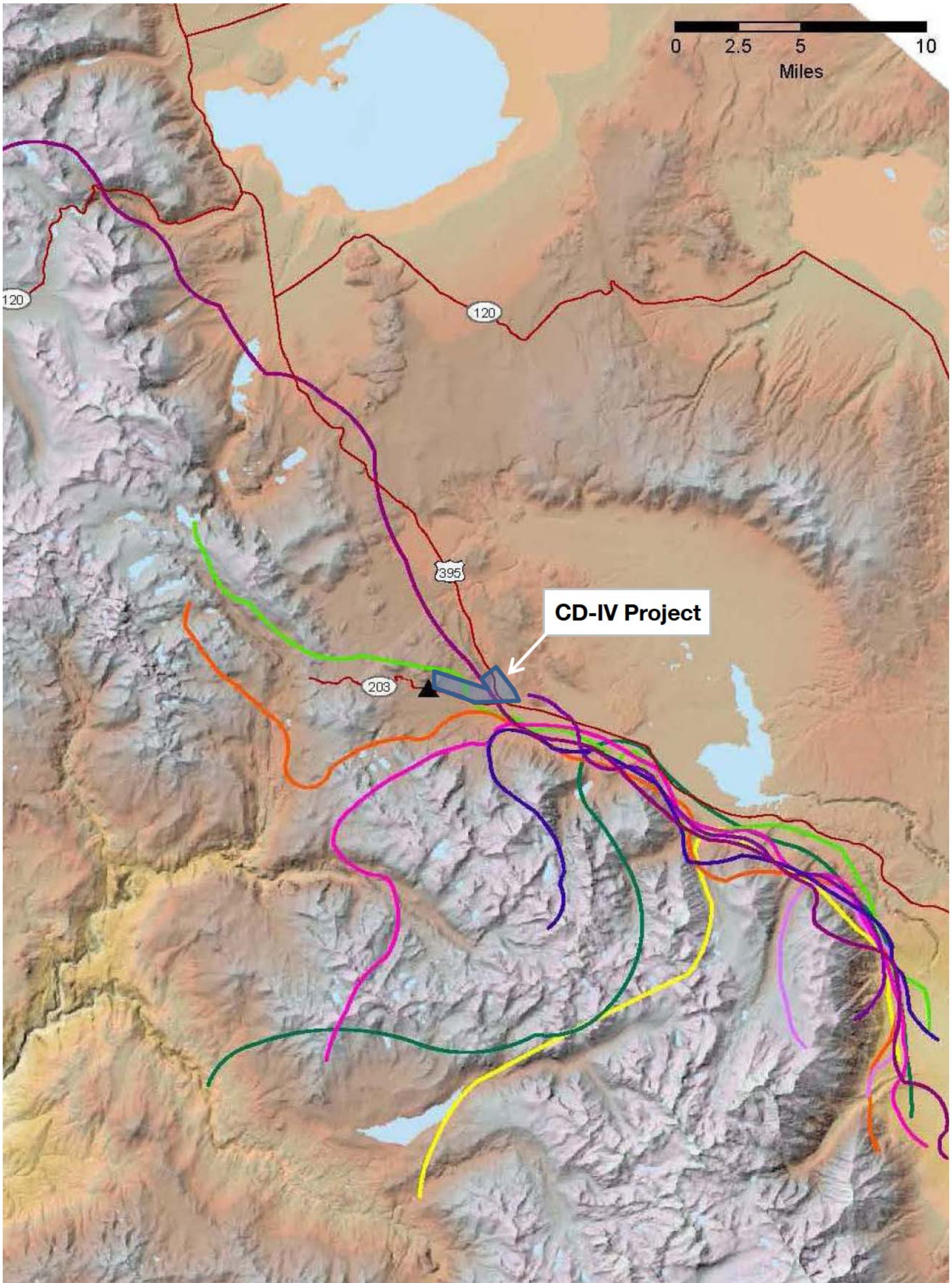
Decommissioning

Decommissioning is anticipated to only directly affect areas that were previously disturbed during installation of CD-IV Project facilities. Thus, the direct removal of wildlife habitat is not anticipated for decommissioning activities. Potential direct and indirect effects to wildlife populations during decommissioning are similar to those described for the construction phase of the CD-IV Project and include wildlife disturbance from noise, light, or dust, and the introduction of invasive plant species by various vectors. Revegetation of the site and removal of facilities would ultimately restore wildlife habitat values in the area.

Mule Deer Migration

Construction

The location of the CD-IV Project is located within the spring and fall migration route of the identified Round Valley herd and the Casa Diablo herd (see Figure 4.4-1). Recent population estimates of these herds put the total for the Round Valley herd at 2,194 animals and the Casa Diablo herd at 2,805 animals. Characteristics of the vegetation in the study area 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 (2011a) has recently documented “resident” mule deer use of the study area 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 study area 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).



Round Valley Herd migration routes as mapped using radio collared mule deer. Taken from Monteith, et al., 2009. Two routes show migrating deer passing through the CD-IV Project Area.

SOURCE: ESA

Casa Diablo IV Geothermal Development Project . 209487

Figure 4.4-1
Deer Migration Routes

The study area does contain important browse species, such as bitterbrush. Construction of the CD-IV Project would remove some habitat important for foraging, but the most important and limiting aspect of the CD-IV Project would relate to the study area being utilized as a deer movement corridor. Based on deer track crossing studies performed in 2011 (MACTEC, 2011; Paulus 2011a; 2012a; 2012b), migrating deer travel down slope through Jeffrey pine forest north of the study area, crossing Upper Basalt and Basalt Canyons, and through the Casa Diablo Geothermal Complex to reach the meadow and riparian communities associated with Mammoth Creek to the southwest. Migrating deer currently pass east of the existing power plant locations and between the MP-I and MP-II power plants in the Casa Diablo area.

Potential interactions between deer and CD-IV Project elements arise from the unproven but reasonable notions that migrating deer will not exhibit tolerance to new power plant noise and activity and will not readily adapt to movement across new aboveground pipelines associated with geothermal energy production. Members of the resident deer population in summer and early fall 2011 used habitats that are available near existing facilities in the study area uniformly, indicating adaptation (Paulus, 2012b). Migratory deer, however, may not remain long enough to adapt and may be thwarted in their habitat usage for movement along traditional paths by any new installation of linear barriers. The most notable of these would be the aboveground pipeline proposed to cross through the western portion of Casa Diablo, bisect Basalt Canyon, and then enter the eastern portion of Upper Basalt. Interactions that could redirect deer onto U.S. Highway 395 or into areas of increased predation could be minimized by undergrounding the proposed pipeline and avoiding erecting any new linear barrier at these locations. Additional passages of this nature could be provided nearer to the highway. Tracks mapped at the seven existing 30-50 ft underground sections of the Basalt Canyon Pipeline by Paulus (2011a; 2012b) demonstrate that deer used this type of passage during both the residency and migration periods in 2011. Migrating deer readily leap the existing Basalt Canyon Pipeline wherever it crosses their path as a single aboveground pipe, and will even stoop to pass under a single pipeline where it is elevated slightly more than the existing standard (Paulus, 2011b), so proactive design that emphasizes single pipe with either underground or overhead passages will likely benefit deer that are not able to otherwise tolerate or adapt to the Proposed Action. In addition, the vertical expansion loops will permit wildlife crossings. The CD-IV Project contains sections of parallel pipe alignments in several locations. Table 4.4-1 shows the lengths of double pipelines by alternative (lengths include existing single pipeline).

TABLE 4.4-1
LENGTHS OF PARALLEL PIPELINE CONSTRUCTION BY ALTERNATIVE

	Alt 1 Proposed Project	Alt 2 Plant Site Alternative	Alt 3 Modified Pipeline Alignment	Alt 4 No Action
Parallel Pipeline Length	3.5 miles	3.9 miles	3.7 miles	0

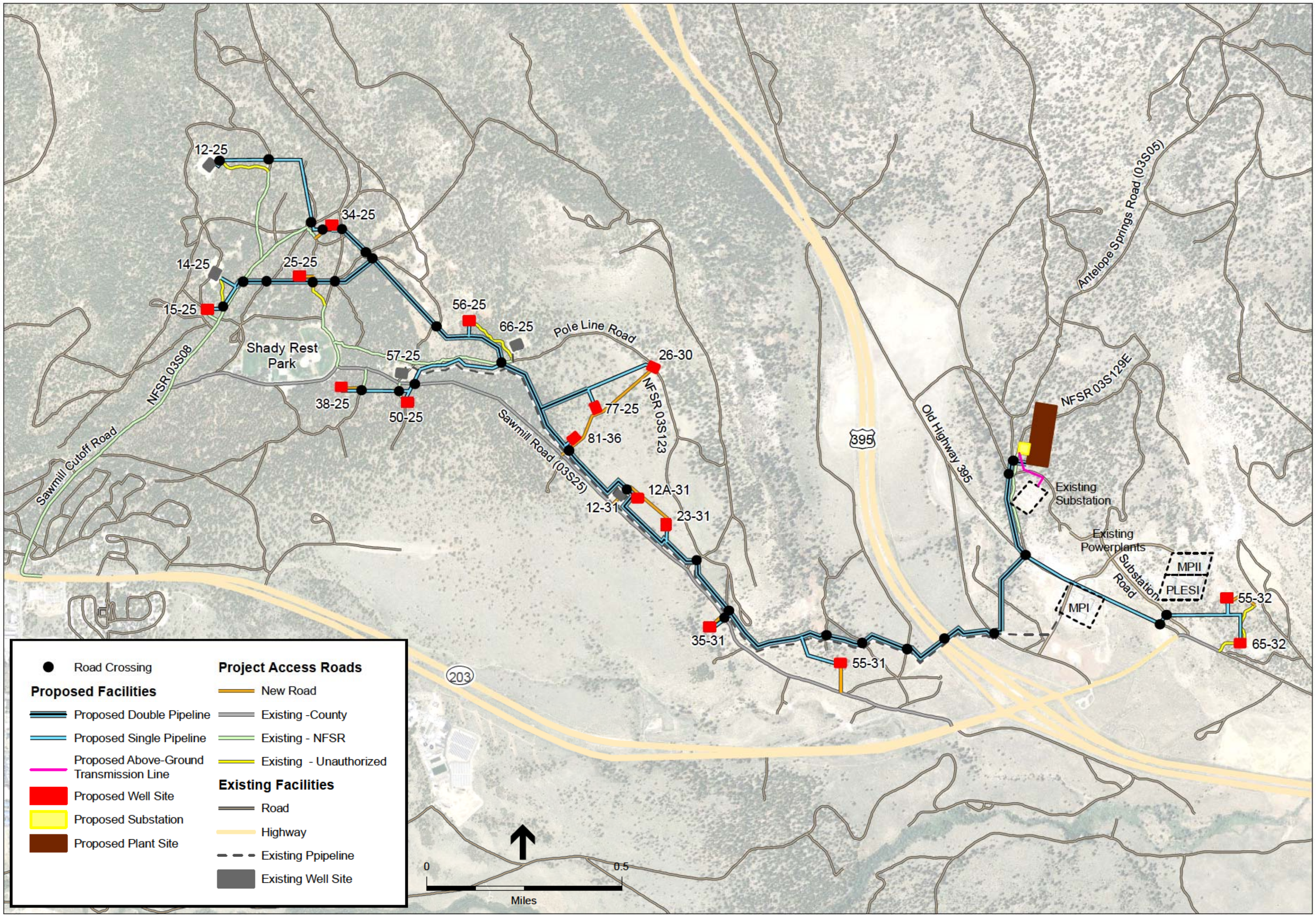
NOTE:
[1] Includes the existing production pipeline not associated with the CD-IV Project.

Under the Proposed Action, where the pipeline would cross an existing road, the pipeline would be installed underground. These underground sections (shown in Figure 4.4-2) would provide for areas where deer could cross multiple pipelines without having to jump consecutive pipes.

The location of the new power plant and the pipelines running south of it in the Proposed Action would introduce new barriers to mule deer migration moving downslope from north to south to access meadow and riparian communities associated with Mammoth Creek. It is not known whether this would force some migrating deer further west and closer to U.S. Highway 395 where they would be subject to increased mortality due to vehicular collisions. To avoid this potential risk, it would be important to avoid erecting any temporary barriers used during construction that could re-direct deer further to the west and near the U.S. Highway 395 corridor. There is abundant habitat east of the power plant site that could be utilized by migrating deer. Also, implementation of **Mitigation Measure WIL-4** would provide deer a pipeline crossing south of the proposed plant site. This would reduce but not eliminate the threat from collisions with vehicles to migrating deer that this segment of pipeline poses.

The biological survey assessment of deer movement through the existing MP-I Project area concluded that partial closure of the movement corridors located between the existing MP-I and MP-II/PLES-I plant sites for the proposed M-I plant site would not substantially change the use of the movement corridor by resident deer (Paulus, 2012a). Upon investigation of other regularly used paths of movement from the habitat north of the Casa Diablo area to Mammoth Creek, it was observed that resident deer exhibit tolerance for the existing power plants, following the perimeter fencing closely despite the noise and activity in these geothermal areas of operation, as if to reach water by the shortest path (Paulus, 2012a). There are not sufficient data to speculate how migrating deer would respond to the new barriers associated with the Proposed Action. If movement patterns of either resident or migratory deer are thwarted by the increase in noise, lighting and traffic at this corridor, the animals could be redirected to the west of the Casa Diablo Geothermal Complex and possibly onto U.S. Highway 395 with increased frequency. The deer could alternatively be redirected to the east of the existing facilities, where existing high-traffic deer trails exist with no additional known threats. Based upon usage data generated by the fall 2011 track study, it is estimated that up to 40 to 50 summer-resident deer, up to 300 migrating deer (+/- 29 to 49), and up to 10 to 20 winter-resident deer could be redirected through or around the Casa Diablo geothermal complex in one direction or the other (Paulus, 2012a). This would be a “worst case” impact, as resident deer have demonstrated tolerance to the same types of potential deterrence that are proposed.

PDM BIO-1 will be implemented to determine if new pipelines are impeding wildlife movement, including migrating deer. In addition, **Mitigation Measures VEG-1, WIL-4, WIL-5, WIL-6, and WIL-7** would further reduce the adverse affects of the Proposed Action on mule deer or mule deer movement through the Project area. These mitigation measures provide migratory crossings and movement corridors for deer while also protecting foraging habitat.



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

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Figure 4.4-2
Proposed Project Road Crossings

Operation and Maintenance

Operation and maintenance of the Proposed Action are not expected to impact mule deer migration patterns over those discussed above for construction.

Decommissioning

At the end of the expected life of the proposed power plant, wells, and pipelines, the equipment and facilities would be properly dismantled and the site would be restored to pre-project land uses. Revegetation of the site and removal of facilities would ultimately restore habitat for mule deer in the area.

4.4.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.2.2.

a) *Have a substantial adverse effect, either directly, or through habitat modifications on any species identified as a candidate, sensitive, or special status in local or regional plans, policies, or regulations or by the CDFW or the USFWS.*

Construction

As described above, the Proposed Action is anticipated to result in temporary and/or permanent impacts to individuals or habitat of northern goshawk, pallid bat, and Sierra marten. Under CEQA, these impacts would be considered significant. However, implementation of PDMs related to biological resources as well as **Mitigation Measures WIL-1 through WIL-9** would reduce these impacts to *less than significant.*

Operation and Maintenance

As described above, once construction of the Proposed Action is completed, noise and human activity are expected to be similar to pre-project conditions. Operations and maintenance of Project facilities has the potential to introduce invasive plant species into disturbed areas and facilitate the spread of noxious weeds. This could result in the degradation of special-status wildlife species habitat outside of the power plant site and linear corridors. The application of PDMs BIO-3, BIO-4, BIO-5, BIO-6, and BIO-7 would reduce these impacts to *less than significant*.

Operation of the Proposed Action has the potential to impact Owens tui chub and Owen sucker habitats. As discussed above, increasing geothermal fluid production in the geothermal reservoir is not anticipated to cause adverse impacts to springs, surface waters, and other hydrologic surface features that could provide habitat to these species. Existing monitoring programs under the oversight of the Long Valley Hydrologic Advisory Committee would be expanded to include monitoring for the Proposed Action, in accordance with PDM GEO-5 and BLM permit conditions of approval. Potential impacts would be less than significant.

Decommissioning

Impacts to special-status wildlife species are not anticipated for decommissioning activities. Therefore, there is *no impact.*

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Construction

As described above, the Proposed Action is anticipated to result in temporary and/or permanent impacts to migrating mule deer and other wildlife species. Under CEQA, these impacts would be considered significant. However, implementation of PDM BIO-1 as well as **Mitigation Measures WIL-4 through WIL-7** would reduce these impacts to *less than significant.*

Operation and Maintenance

Operation and maintenance of the Proposed Action are not expected to impact mule deer migration patterns over those discussed above for construction. Under CEQA, these impacts would be considered significant. However, implementation of PDM BIO-1 as well as **Mitigation Measures WIL-4 through WIL-7** would reduce these impacts to *less than significant.*

Decommissioning

At the end of the expected life of the proposed power plant, wells, and pipelines, the equipment and facilities would be properly dismantled and the site would be restored to pre-project land uses. Revegetation of the site and removal of facilities would restore mule deer habitat in the area.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Construction, Operation and Maintenance, and Decommissioning

The CD-IV Project would not conflict with any local policies or ordinances protecting biological resources, and it is consistent with the Conservation/Open Space Element of the Mono County General Plan and the Resource Management and Conservation Element of the Town of Mammoth Lakes General Plan.

4.4.5 Alternative 2: Plant Site Alternative

4.4.5.1 Direct and Indirect Impacts

General Wildlife and Habitat

Potential impacts to general wildlife and their habitats during construction, operation and decommissioning of Alternative 2 would be similar in nature as described for the Proposed Action, although impacts to specific habitat types would vary slightly but not in a way that would result in impacts substantially different from the Proposed Action. The types of impacts that would occur under Alternative 2 similarly would result in the direct and permanent loss of all habitats within the disturbance footprint, and indirect impacts to general wildlife and their habitats would be similar to those discussed for the Proposed Action. Implementation of PDMs and mitigation measures protecting wildlife and their habitats would reduce potential impacts, but impacts would not be completely avoided.

Special-Status Species

Construction

Potential impacts to special-status wildlife species during construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of PDMs and mitigation measures designed to protect special-status wildlife would reduce potential impacts to special-status species, but impacts would not be completely avoided.

Operation and Maintenance

Once the CD-IV Project is completed, noise and human activity are expected to be similar to pre-project conditions. Potential impacts to special-status wildlife species during operation of Alternative 2 would be the same as described for the Proposed Action. Implementation of PDMs and mitigation measures designed to protect special-status wildlife would reduce potential impacts to special-status species.

Decommissioning

Decommissioning is anticipated to only directly affect areas that were previously disturbed during installation of CD-IV Project facilities. Thus, the direct removal of wildlife habitat is not anticipated for decommissioning activities. Potential direct and indirect effects to wildlife populations during decommissioning are similar to those described for the construction phase of the CD-IV Project and include wildlife disturbance from noise, light, or dust, and the introduction of invasive plant species by various vectors. Revegetation of the site and removal of facilities would ultimately restore wildlife habitat in the area.

Mule Deer Migration

Construction, Operations and Maintenance

Potential impacts to mule deer migration patterns during construction and operation and maintenance of Alternative 2 would be similar in nature as described for the Proposed Action, although impacts to migratory deer in the vicinity of the Casa Diablo Geothermal Complex would vary slightly and likely be reduced. Alternative 2 would place the location of the proposed power plant site to the east of the existing MP-II power plant. This would in effect shift impacts to migratory deer in the vicinity of the Casa Diablo Geothermal Complex to the east away from U.S. Highway 395. This could potentially reduce the mortality of deer due to vehicle collisions as compared to the Proposed Action. Under Alternative 2, however, there are 0.4 miles more of double pipelines and 0.13 mile more of triple pipeline compared to the Proposed Action which could result in slightly increased impedance to deer movement.

Under Alternative 2, same as the Proposed Action, where the pipeline would cross an existing road, the pipeline would be installed underground. These underground sections (shown in Figure 4.4-3) would provide for areas where deer could cross multiple pipelines without having to jump consecutive pipes. PDM BIO-1 will be implemented to determine if new pipelines are impeding wildlife movement, including migrating deer. In addition, **Mitigation Measure WIL-4** through **WIL-7** would further reduce the adverse affects of Alternative 2 on mule deer or mule deer movement through the Project area.

Decommissioning

At the end of the expected life of the proposed power plant, wells, and pipelines, the equipment and facilities would be properly dismantled and the site would be restored to pre-project land uses. Revegetation of the site and removal of facilities would ultimately restore mule deer habitat and movement corridors in the area.

4.4.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 2 on wildlife would remain less than significant.

4.4.6 Alternative 3: Modified Pipeline Alternative

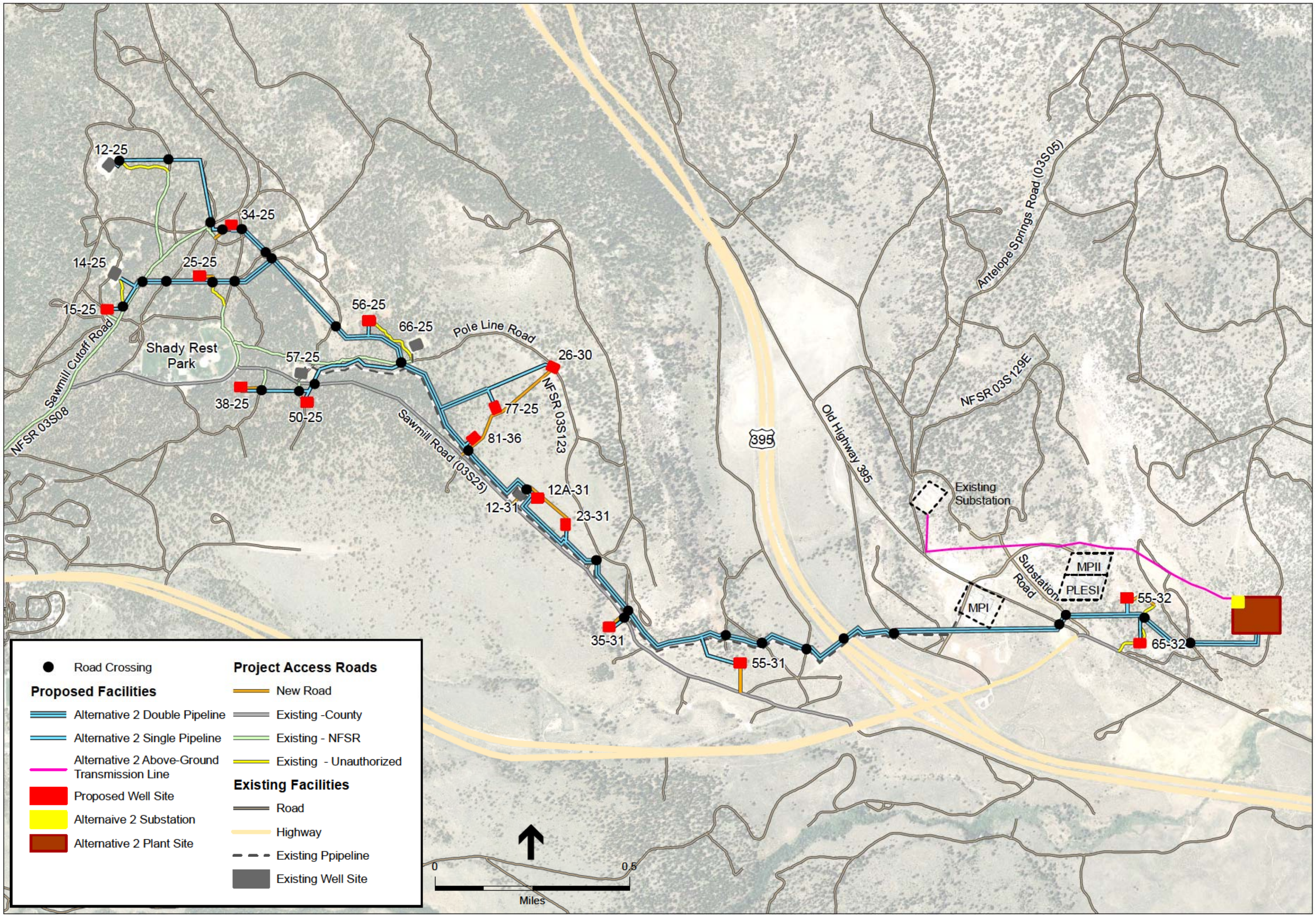
4.4.6.1 Direct and Indirect Impacts

General Wildlife and Habitat

Potential impacts to general wildlife and their habitats during construction, operation and decommissioning of Alternative 3 would be similar in nature, although impacts to specific habitat types would vary slightly but not in a way that would result in impacts substantially different from the Proposed Action. The decrease in pipeline corridor lengths would lead to slightly less disturbance and removal of habitats as compared to the Proposed Action. The types of impacts that would occur under Alternative 3 similarly would result in the direct and permanent loss of all habitats within the disturbance footprint, and indirect impacts to general wildlife and their habitats would be similar to those discussed for the Proposed Action. Implementation of PDMs and mitigation measures protecting wildlife and their habitats would reduce potential impacts, but impacts would not be completely avoided.

Special-Status Species

Potential impacts to special-status wildlife species during construction, operation and decommissioning of Alternative 3 would be similar in nature, though of slightly smaller magnitude as described for the Proposed Action. The decrease in pipeline corridor lengths would lead to slightly less disturbance and removal of habitat as compared to the Proposed Action. Implementation of PDMs and mitigation measures designed to protect native vegetation communities would reduce potential impacts to special-status species, but impacts would not be completely avoided.



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

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Figure 4.4-3
Road Crossings for Alternative 2

Mule Deer Migration

Construction, Operations and Maintenance

Potential impacts to mule deer migration patterns from construction and operations and maintenance of Alternative 3 would be similar in nature and magnitude as described for the Proposed Action.

Under Alternative 3, same as the Proposed Action, where the pipeline would cross an existing road, the pipeline would be installed underground. These underground sections (shown in Figure 4.4-4) would provide for areas where deer could cross multiple pipelines without having to jump consecutive pipes.

PDM BIO-1 will be implemented to determine if new pipelines are impeding wildlife movement, including migrating deer. In addition, **Mitigation Measures WIL-4 through WIL-7** would further reduce the adverse affects of Alternative 3 on mule deer or mule deer movement through the Project area.

Decommissioning

At the end of the expected life of the proposed power plant, wells, and pipelines, the equipment and facilities would be properly dismantled and the site would be restored to pre-project land uses. Revegetation of the site and removal of facilities would benefit mule deer in the area.

4.4.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 3 would remain less than significant.

4.4.7 Alternative 4: No Action

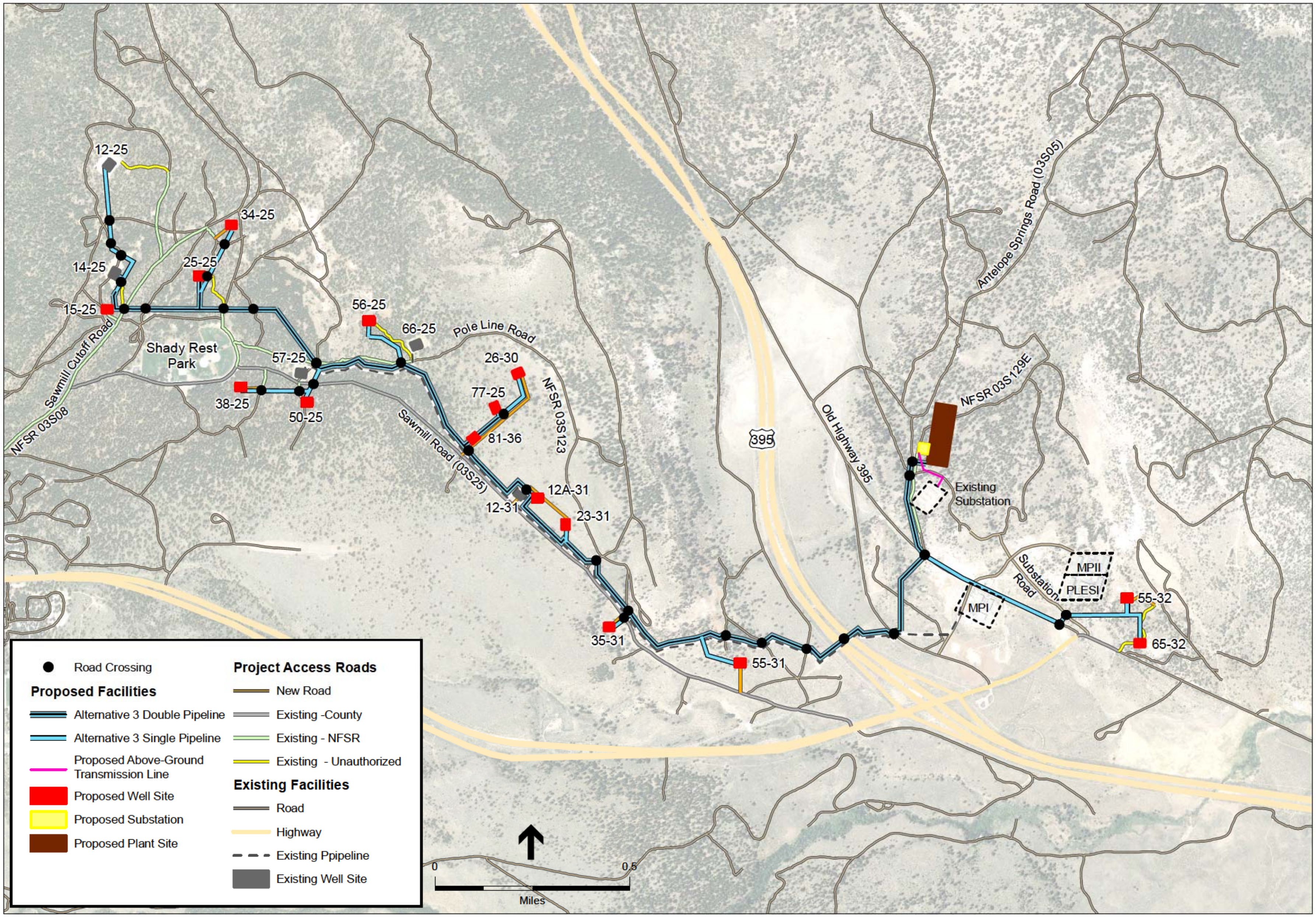
4.4.7.1 Direct and Indirect Impacts

Under this alternative, the BLM would not approve the CD-IV Project. Direct and indirect impacts related to the construction, operation and decommissioning of the power plant or pipelines would not occur.

If Alternative 4 were implemented, no changes would be implemented on the power plant site and the existing environmental setting described in Draft EIS/EIR Chapter 3 would be maintained. As a no-development alternative, the No Action Alternative would result in no changes to conditions related to wildlife resources; therefore, no impact would occur.

4.4.7.2 CEQA Significance Determination

Alternative 4 would result in no impacts to wildlife resources.



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

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Figure 4.4-4
Alternative 3 Road Crossings

4.4.8 Cumulative Impacts

4.4.8.1 Geographic Extent/Context

The geographic scope of wildlife resources impacts encompasses the wildlife habitats of affected species in the region, including Jeffrey pine forest, big sagebrush scrub, singleleaf pinyon woodland, and Wright's buckwheat dwarf scrub, as well as aquatic habitat in the Mammoth Creek watershed and other downstream watersheds. The Project area is located within or adjacent to federal, state, and county lands that are largely undeveloped and support native vegetation communities. In addition, development associated with the Town of Mammoth Lakes abuts the Project area to the south and east.

The analysis of cumulative effects considers a number of variables including geographic (spatial) limits, time (temporal) limits, and the characteristics of the resources being evaluated. The geographic scope of this analysis is based on the nature of the geography surrounding the Project area and the characteristics and properties of each resource. In addition, each project will have its own implementation schedule, which may or may not coincide or overlap with the CD-IV Project schedule. This is a consideration for short-term impacts from the CD-IV Project. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the CD-IV Project.

4.4.8.2 Existing Cumulative Conditions

Natural communities and associated wildlife habitats in the cumulative analysis area historically have been altered by human activities, resulting in conversion of undeveloped land and habitat loss, fragmentation, and degradation. Future growth and development in the analysis area will likely continue these impacts. General threats to common and special-status wildlife species in the cumulative effects study area include the fragmentation of habitat from roads and urban or rural development, the effects of historic livestock grazing on wildlife forage structure and availability, and agricultural development.

Wildlife habitats are largely similar in the analysis area and consist primarily of a variety of scrublands and singleleaf pinyon woodlands at lower elevations and coniferous forests at higher elevations. Occasional montane meadow habitats dot the higher elevations, with open grasslands occurring sporadically at lower elevations. Riparian woodlands occur along the wetter drainages. Potential federally jurisdictional wetlands and waters of the U.S. as well as CDFW jurisdictional habitats are limited in the study area; however, it is likely that jurisdictional habitats occur throughout the analysis area.

The study area supports habitats for a variety of special-status wildlife species. It is expected that the cumulative analysis area, particularly undeveloped lands, would also support some number of special-status wildlife species, some of which could be federal or state listed. In fact, the CNDDB shows a number of special-status species occurring in the analysis area.

4.4.8.3 Reasonably Foreseeable Projects

A wide variety of past, present, and reasonably foreseeable future development projects could contribute to the cumulative conditions for wildlife resources in the cumulative analysis area. Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the Project site and surrounding area and was used to develop this analysis of cumulative effects for wildlife resources. Most of these projects have either undergone independent environmental review pursuant to NEPA and/or CEQA or will do so prior to approval. Even if environmental review has not been completed for the cumulative projects described in Table 4.1-1, their effects were considered in the cumulative impacts analyses in this EIS/EIR.

Projects identified on the cumulative projects list on Table 4.1-1 that could result in cumulative wildlife impacts include (among others):

1. MP-I Replacement Project
2. MP-II Project
3. PLES-I Project
4. New Airport Terminal
5. Waterford Bridges Project
6. Old Mammoth Place
7. Search and Rescue Facility
8. Snowcreek Master Plan
9. Mammoth View Project
10. Sawmill Cutoff Road Reconstruction Project
11. Shady Rest Park

4.4.8.4 Construction, Operations and Maintenance, and Decommissioning

General Wildlife and Habitats

Direct impacts to wildlife as a result of the Proposed Action includes temporary and permanent loss of habitat along with the displacement and/or potential mortality of wildlife species that are poor dispersers such as snakes, lizards, and small mammals. Similarly, the list of cumulative projects implemented in undeveloped areas would have the potential to result in similar impacts. However, the combined effect of impacts to non-sensitive wildlife species from the Proposed Action and impacts of the cumulative projects is not considered to be significant because these species are common and wide-ranging over the entire study area and are expected to recover from these losses given the large populations within the region.

Construction, operations and maintenance, and decommissioning activities would result in temporary and permanent losses of wildlife habitats including 36.86 acres of Jeffery pine forest and 39.56 acres of big sagebrush scrub. Despite measures to protect and remediate losses, construction of the CD-IV Project would cause both temporary (during construction from vegetation clearing) and permanent (displacement of habitats with Project features such as the power plant site and well pad sites) impacts to habitat communities as described in Section 4.4.4. Most of the projects identified in Table 4.1-1 also would result in temporary and permanent losses of wildlife habitats through grading and clearing activities to construct roads, utility infrastructure, and commercial, industrial, and residential developments. However, the CD-IV Project and the other projects would be required to mitigate impacts to sensitive wildlife habitats. With implementation of such measures, the CD-IV Project's contribution to a significant cumulative impact to sensitive wildlife habitats would be rendered less than cumulatively considerable.

Special-Status Species

Implementation of the Proposed Action would result in impacts to listed or sensitive wildlife species, including: northern goshawk and other sensitive avian species, Sierra marten, and bats. Impacts to these species would be the result of direct loss of suitable habitat (76.42 acres of habitat), direct loss of known locations of individuals, or indirect effects due to human disturbance or changes in habitat quality during construction and O&M. Implementation of the mitigation measures described below would mitigate these impacts. However, wildlife species that are listed or considered to be sensitive are already considered to be compromised, partly or completely (depending on the species) as a result of past and continued human activity and development throughout the region.

As such, any cumulative activities that would considerably contribute to adverse affects on wildlife species would be considered significant. Therefore, although localized impacts of the Proposed Action to the aforementioned species may be considered less than significant, when combined with similar impacts of past, present, and future projects, these impacts would considerably contribute to a cumulative impact for these species. Implementation of PDMs and mitigation measures related to biological resources would reduce the Proposed Action's contribution to these impacts.

Habitat Connectivity and Wildlife Movement

As discussed above, CD-IV Project impacts on wildlife movement corridors would be mitigated to less than significant. However, under the cumulative development scenario some residual impacts to wildlife movement are likely to remain even following the application of mitigation measures. Permanent CD-IV Project facilities create a wildlife movement barrier that will alter but not likely impede the movement of mule deer or other highly mobile species.

The effects of proposed and future actions on habitat connectivity and wildlife movement are likely to remain following mitigation, even after the application of mitigation measures. This cumulative impact is due to the residual effects of habitat fragmentation and impaired connectivity. It is expected that mule deer habitat located north and east of CD-IV Project facilities will continue to provide habitat connectivity for mule deer and other migratory wildlife. With substantial habitat connectivity remaining following the cumulative development scenario, the reduced size of the movement corridor presents an adverse impact to the migratory wildlife. Direct and indirect effects to mule deer will be reduced and mitigated through the application of PDM BIO-1 and the implementation of **Mitigation Measures WIL-4 through WIL-7**. Consequently, the CD-IV Project's cumulative contribution to the loss of mule deer habitat connectivity and wildlife connectivity in general would be rendered less than cumulatively considerable.

4.4.8.5 CEQA Significance Determinations

As described above, the CD-IV Project's contribution to a significant cumulative impact on general wildlife and special-status wildlife species would be rendered less than cumulatively considerable and, therefore, not significant.

4.4.9 Mitigation Measures

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 500 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 CDFW, 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). Surveys will include both stand search and broadcast acoustical survey methodologies as described in 2000 USDA Forest Service *Protocol for the Northern Goshawk in the Pacific Southwest Region*.

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 500 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 CDFW, USFS, and USFWS although a 500-foot buffer would be used initially prior to agency consultation. 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 CDFW, 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 CDFW, 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, and monitored during spring months to ensure that water does not accumulate as snow melts. 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 USFWS, USFS, and CDFW approval. If indications of a hazardous materials release such as oils or surface films are observed in basins, netting or screening shall be used when basins are unstaffed to prevent access by birds and other wildlife.

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, and use cleared trees, woody vegetation, and brush materials to retain existing habitat and provide new Sierra marten hunting and denning opportunities.

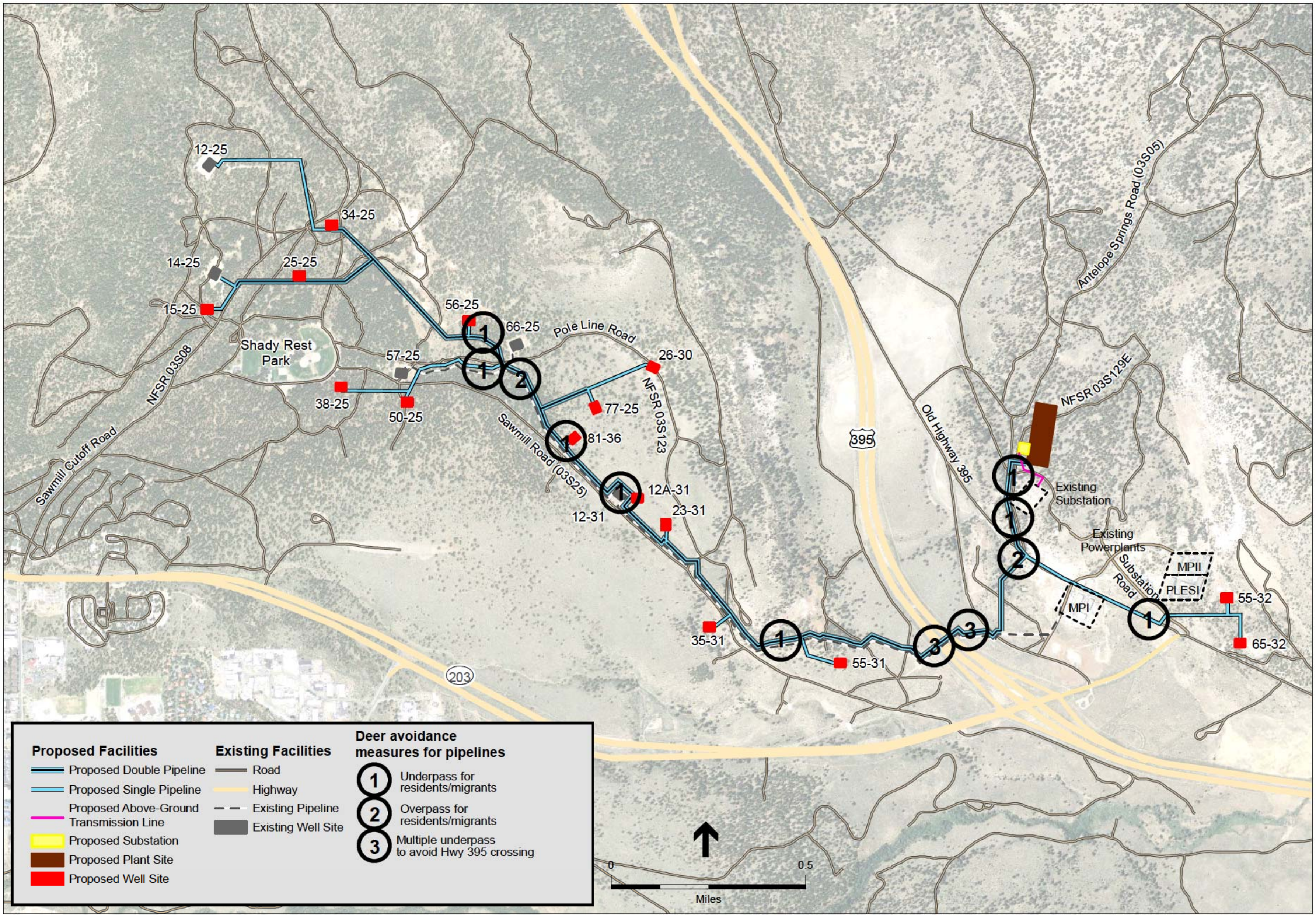
Mitigation Measure WIL-4: (This mitigation measure only applies to Alternatives 1 and 3) A new deer crossing shall be constructed over the proposed pipeline running south of the power plant site between the existing substation and the existing MP-I power plant to enhance mule deer and other wildlife movement through the Project area. The new crossing will be designed with input from the CDFW 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, underground 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). If used, overhead segments shall be of sufficient height to allow wildlife and people (or vehicles) to pass under the pipeline. Alternately, underground segments shall be a minimum of 30 feet in length. 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. The Monitoring Plan will also include details regarding methodologies to determine if the pipeline corridors are impeding wildlife movement (per PDM BIO-1) (e.g., if tracks do not cross designated crossing areas), and shall include remedial actions if impedance of wildlife movements is detected, or if the various measures proposed to promote deer crossings are not being utilized by migrating deer (e.g., installing at-grade or similar crossing structures). The Monitoring Plan shall also include performance measures for determining if the various deer crossing measures proposed are meeting their goals. At a minimum, monitored elements shall include: 1) a pre- and post- construction deer movement study that employs remote camera stations that is capable of determining whether or not deer use remains relatively constant or declines measurably following construction; 2) an assessment of available crossing sites to determine whether or not deer are using the provided above ground or underground sections; and 3) the success of any remedial actions, if needed (for example, the success of additional created at-grade structures), to facilitate deer movement through the Casa Diablo complex. As a result of post-project monitoring studies, any indications that changes to the environment resulting from the Project result in significantly greater (e.g., >25 percent above baseline) vehicle-related mule deer mortality or significantly reduced on-site deer population size or habitat use that cannot otherwise be explained by environmental factors shall warrant the incorporation of additional measures such as the one-by-one construction of at-grade or similar deer crossing structures at key locations to reduce impacts on deer movement.

Mitigation Measure WIL 7: The following measures are required to protect mule deer and general wildlife:

a) External safety lighting associated with Project construction and operations shall be designed to minimize effects to wildlife and lighting of natural habitat at night. Operational lighting at the plant site and well sites would be directed downward and shielded, or directed inward away from natural habitat and wildlife movement corridors.



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

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Figure 4.4-5
Deer Avoidance Measures

b) To the maximum extent feasible, all noise-generating construction activities on Project linear corridors shall be limited to daylight hours.

c) During construction, operation and maintenance, and decommissioning, solid waste materials (trash) shall be stored in containers that are inaccessible to wildlife. Trash shall be routinely collected and deposited at an authorized landfill to avoid attracting predators to the Project area.

Mitigation Measure WIL-8: Conduct Pre-construction Bat Surveys. If construction, grading or other Project-related activities are scheduled during the breeding season of native bat species (April 1 to August 31), pre-construction surveys shall be conducted prior to the initiation of construction by a qualified wildlife biologist to determine whether active roosts are present on site or within 50 feet of Project activities. Field surveys shall be conducted early in the breeding season before any construction activities begin, when bats are establishing maternity roosts but before pregnant females give birth (April through early May). If no roosting bats are found, then no further mitigation is required. If roosting bats are found, then disturbance of the maternity roosts shall be avoided by halting construction until the end of the breeding season or a qualified bat biologist removes and relocates the roosting bats in consultation with CDFW.

Mitigation Measure WIL-9: Conform to Avian Power Line Interaction Committee Guidelines. Electric distribution poles or towers being modified or integrated with the Project shall be compliant with measures defined by the Avian Power Line Interaction Committee (APLIC).

Mitigation Measure WIL-10: Owens Tui Chub Habitat and Population Monitoring. Prior to commercial production or injection of geothermal resources, the Applicant shall develop and implement an Owens Tui Chub Population and Habitat Monitoring Plan and amend the existing Remedial Action Plan, in coordination with the BLM. CDFW and USFWS would be invited to participate in the development and implementation of the plan. The Population and Habitat Monitoring Plan and amendment to the Remedial Action Plan shall be approved by BLM, CDFW, and USFWS prior to implementation. The Plans are intended to identify and quantify potential changes to fish habitat and populations at AB and CD springs and Little Hot Creek Pond. The plans shall include the following measures:

a) Conduct baseline (year zero) and ongoing fish surveys using CDFW and USFWS-approved survey methods in portions of the AB/CD springs, and Little Hot Creek Pond where water quality changes could potentially affect Owens tui chub habitat or populations;

b) Collect baseline (year zero) benthic macroinvertebrate (BMI) samples at the same sampling sites and dates as the fish surveys described above, and periodically concurrent with fish surveys after the initial collection;

c) Conduct a baseline (year zero) and periodic stream habitat assessments in accordance with agency-approved survey protocols. These assessments shall include a quantitative evaluation of physical stream characteristics, and aquatic and riparian vegetation;

d) Incorporate the collected population and habitat data into an analysis and discussion of water quality data collected in AB and CD springs, and Little Hot Creek Pond such as field measurements for air and water temperature, conductivity, dissolved oxygen (concentration and percent saturation), flow, turbidity, and hydrogen ion concentration (pH). Additional parameters may include, but are not limited to, sampling for total suspended solids (TSS), hardness, aluminum, and chromium to be collected, preserved, and sent to a certified analytical laboratory for analysis.

e) Prepare an annual data report summarizing the current year's survey and sampling results, including analyses of trends and conditions. A draft report will be made available for BLM review by December 31 of each year. The summary report will also include an analysis and discussion of water quality data. The report will be provided to CDFW and USFWS for review.

f) Amend the existing Remedial Action Program to include measures specific to changes in Owens tui chub populations and primary constituent elements, such as aquatic vegetation, water quality, and an adequate insect prey base.

4.4.10 Residual Impacts after Mitigation Incorporated

Following implementation of mitigation measures provided in Section 4.4.9 as well as all suitable PDMs, all adverse impacts on wildlife resources resulting from construction, operations and maintenance, and decommissioning of the CD-IV Project and Alternatives would be avoided or substantially reduced.

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4.5 Climate Change

4.5.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts related to GHG emissions and climate change. The methodology to assess impacts related to GHG emissions and climate change under NEPA is continuing to evolve as consensus forms as to how best to evaluate such effects at both proposed action-specific and cumulative levels. The CEQ published draft guidance on February 18, 2010, for federal agencies to improve their consideration of the effects of GHG emissions and climate change in their evaluation of proposals for federal actions under NEPA. For example, the CEQ proposes that agencies should consider the direct and indirect GHG emissions from a proposed action and its alternatives and quantify and disclose those emissions in the environmental document (40 CFR 1508.25). The CEQ further recommends that agencies consider mitigation measures to reduce proposed action-related GHG emissions from all phases and elements of the proposed action and alternatives over their expected life, subject to reasonable limits based on feasibility and practicality.

4.5.1.1 GHG Emissions

Construction Emissions

Total construction emissions were estimated using Project-specific information identified in the application for the CD-IV Project (MPLP, 2010), as well as other information provided by ORNI 50, LLC (Ormat, 2011). Appendix C.2, *GHG Emission Estimates*, contains the direct and indirect emissions estimates calculations and all of the assumptions used to estimate the construction GHG emissions that would be associated with the CD-IV Project. For the purposes of the GHG emissions analysis, construction emissions that would be associated with the CD-IV Project are described in terms of three main activity source types, including: power plant construction, well development construction, and pipeline construction.

For each of the construction activity sources, the following information was compiled based on available data and conservative assumptions:

1. A list of the types of off-road construction equipment and on-road vehicles to be used;
2. The number of pieces of each type of off-road equipment and on-road vehicles;
3. Daily equipment and vehicle usage rates in terms of hours per day or miles traveled per day for each piece of off-road equipment and on-road vehicles, respectively;
4. The horse-power (hp) rating for each type of off-road equipment used; and
5. Daily water use rates for the indirect emissions estimates.

Off-Road Equipment

The combustion of diesel fuel to provide power for the operation of various equipment results in the generation of GHGs. Off-road construction equipment diesel fuel consumption rates for calendar year 2013 in the GBVAB were estimated using CARB's new Offroad 2011 emissions model. The fuel consumption factors for the specific pieces of construction equipment were estimated for calendar year 2013. GHG emissions for off-road construction equipment were estimated by multiplying the total diesel fuel consumed by each piece of equipment by CO_2, N_2O, and CH_4 emission factors obtained from The Climate Registry (TCR) (TCR, 2011) for diesel fuel combustion. N_2O and CH_4 emissions were multiplied by their respective global warming potentials and added to the CO_2 emissions to obtain CO_2e emissions.

On-Road Motor Vehicle Exhaust Emissions

GHG emissions from motor vehicles used during construction were estimated using the same general methodology described for criteria pollutants from construction vehicles (see Section 4.2.1.1, *Construction Emissions*). Since the EMFAC2007 model provides GHG emission factors only for CO_2 emissions, N_2O and CH_4 emission factors for gasoline and diesel combustion were obtained from TCR (2011). GHG emissions in the form of CO_2e were calculated by multiplying the estimated total miles travelled by Project-related worker vehicles and haul trucks by the GHG emission factors, then multiplying the N_2O and CH_4 emissions by their respective global warming potential, and then adding the CO_2, N_2O, and CH_4 emissions.

Indirect Emissions

Indirect GHG emissions would result from water use for dust control and other construction activities (including well drilling) associated with construction of the Project. These emissions were estimated using daily water use information identified in Section 2.2, *Alternative 1 – Applicant Proposed Action*, and electrical consumption and electrical grid emission factors that include fossil fuel-fired power plants from the CEC and TCR (CEC, 2005; and TCR, 2011), respectively. Based on CEC use factors, it is estimated approximately 250 kWh of electricity would be required for every million gallons of water used (CEC, 2005).

Non-condensable Gases

Proposed well testing would result in minor emissions of non-condensable gases (including CO_2) that are associated with the geothermal fluid. During well cleanout and flow testing, geothermal fluids would likely be pumped into large open containers. CO_2 may temporarily be released from the geothermal fluid for several hours during these activities. The analysis assumes four hours of flow testing per well and a CO_2 emission rate of 0.378 metric ton per hour of release based on well venting data provided by ORNI 50, LLC (MPLP, 2010).

Operation and Maintenance Emissions

Vehicle Exhaust

The GHG emissions from motor vehicles used during operation were estimated using the same methodology described above for GHG emissions from construction phase motor vehicles. Emissions that would be associated with commuting workers and periodic road snow plowing are estimated using the EMFAC2011emission factors multiplied by the estimated long-term operation and maintenance-related employee vehicle trips (up to 12 one-way trips; see Section 4.16-1, *Traffic, Transportation, and Circulation*) and the estimated additional snow plowing mileage (i.e., estimated to be 20 miles per day, twice a week, for five months) that would be associated with the CD-IV Project.

Emergency Standby Diesel Equipment

The CD-IV Project power plant would include operation of one approximately 800 bhp diesel-fueled emergency generator to provide backup power for critical plant control systems in the event of a power outage. Similarly, the proposed power plant would include one approximately 400 bhp diesel-fueled firewater pump to provide power to the firewater pump in the event of a fire emergency. The manufacturer's recommendations for testing and maintenance of the emergency generators would be followed, allowing up to 50 hours per year of operation for maintenance and/or testing purposes (40 CFR Part 89). GHG emissions from diesel combustion that would occur during the intermittent testing and potential emergency use of these engines were estimated using the same methodology (i.e., Offroad2011 fuel consumption and TCR diesel fuel emission factors) as described above to estimate the off-road equipment emissions.

Electrical Equipment Fugitive SF_6

Emissions of SF_6 could be released into the atmosphere due to equipment failure or leakage from electrical equipment such as circuit breakers and switches containing SF_6. The calculations for SF_6 emissions were based on the conservative assumptions that SF_6-containing equipment would include one 33 kV circuit breaker installed for each of the two proposed OECs and the GISs at each of the eight production well pads. Based on other electrical infrastructure projects of similar voltage (CPUC, 2010), it estimated that each of the 33 kV breakers would contain 60 pounds of SF_6 and the GISs at each production well pad would have SF_6 capacities of approximately 30 pounds, for a total of 360 pounds of SF_6.

The SF_6-containing equipment may be hermetically sealed, which are "designed to be gas-tight and sealed for life" (CARB, 2011). Emissions of SF_6 from hermetically sealed circuit breaker can only occur from equipment failure as there is no ability for the user to refill or extract SF_6 due to the factory seal. Because it is not known whether hermetically sealed equipment would be used for the CD-IV Project, a USEPA SF_6 published leak rate of up to 1.0 percent for electrical equipment manufactured in and after 1999 (USEPA, 2006) was used for estimates to provide a conservative upper bound estimate of fugitive SF_6, resulting in 3.6 pounds of fugitive SF_6 per year. Consistent with state, federal, and international standards (CCAR, 2006), a global warming potential of 23,900 was used for SF_6.

Non-condensable Gases

It is assumed that proposed well maintenance would require up to 100 hours of well venting per power plant unit, which would result in minor emissions of non-condensable gases (including CO_2) that are associated with the geothermal fluid. At approximately 600,000 lb/hr of resource per well, the GHG emissions related to well venting would be 37.8 metric tons CO_2e emissions per year for each power plant (MPLP, 2010).

Carbon Sequestration

Implementation of the CD-IV Project would result in direct temporary and permanent losses of Jeffrey pine forest and Sagebrush Scrub, which sequester carbon on an annual basis. The impact of reduced carbon uptake that would result due to the CD-IV Project is assessed qualitatively because there are no known reliable factors available related to the existing annual rate of carbon sequestration applicable to the existing forest and shrub.

Fossil Fuel-Based Energy Displacement

The reduction in GHG emissions by electricity displacement was estimated by assuming the CD-IV Project would displace electricity on the existing electrical grid that includes electricity from fossil fuel-fired power plants continuously over the 30 year life of the CD-IV Project. The CD-IV Project would have a net output of 33 MW and would run continuously, potentially generating over 288,000 MWh annually. An emission factor from TCR for the regional electrical grid was used to estimate the displaced indirect emissions.

Decommissioning Emissions

At the end of the 30-year Project life, the CD-IV Project above and below ground components would be dismantled and removed. The well bores would be plugged with clean drilling mud and cement sufficient to ensure that fluids would not move across aquifers. The well heads (and any other equipment) would be removed, the casings cut off at least six feet below ground surface, and the well sites reclaimed. Typically, above ground equipment 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. Decommissioning activities could generate temporary emissions of GHG similar to those that would occur during construction of the CD-IV Project (see above).

4.5.1.2 GHG Emissions Impact Analysis

Independent of NEPA, but pursuant to 40 CFR Part 98, *Mandatory Reporting of Greenhouse Gases Rule*, USEPA requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2e emissions per year (USEPA, 2011a). In addition, pursuant to 40 CFR Part 52, *Proposed Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule*, the USEPA recently mandated to apply PSD and Title V requirements to facilities whose stationary source CO_2e emissions exceed 100,000 tons per year (USEPA, 2011b). For the purposes of a conservative NEPA analysis, estimated GHG emissions for the Project and alternatives are compared to the federal GHG mandatory emissions reporting threshold of 25,000 metric tons per year to determine whether the GHG emissions would contribute substantially to global climate change.

4.5.1.3 Climate Change

Agencies under the DOI, such as BLM, are required to consider potential impact areas associated with climate change, including potential changes in flood risk, water supply, sea level rise, wildlife habitat and migratory patterns, invasion of exotic species, and potential increases in wildfires. In addition to global warming, climate change also is expected to result in a suite of additional potential changes that could affect the natural environment, in a manner that is relevant to the Project. The potential for climate change to affect the CD-IV Project is discussed qualitatively.

4.5.2 Project Design Measures

There are no PDMs proposed measures to reduce GHG emissions.

4.5.3 CEQA Significance Criteria

Based on CEQA Guidelines Sections 15064.4 and 15064.7(c), as well as Appendix G, a project would cause adverse impacts associated with GHG emissions if it would:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

CEQA allows for the significance criteria established by the applicable air district to be used to assess the impact of a project relative to GHG emissions; however, the GBUAPCD has not established any significance criteria.

The SCAQMD has adopted an operational significance threshold of 10,000 metric tons CO_2e per year for stationary/industrial sources (SCAQMD, 2008). The SCAQMD-adopted GHG significance thresholds are intended for long-term operational GHG emissions; however, the SCAQMD has developed guidance for the determination of significance of GHG construction emissions that recommends that total emissions from construction be amortized over 30 years and added to operational emissions and then compared to the applicable significance threshold (SCAQMD, 2008). For a conservative impact analysis of the CD-IV Project and Alternatives, the CEQA analysis also includes a comparison of Project emissions to the threshold of 10,000 metric tons using the SCAQMD's guidance with regard to the assessment of construction-related GHG emissions.

There are no Mono County climate action plans, policies, or regulations that would be applicable to the Project. However, the Project's potential to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions is assessed by examining any potential conflicts with the GHG reduction goals set forth in AB 32, including the potential for the Project to conflict with any of the 39 Recommended Actions identified by CARB in its Climate Change Scoping Plan and/or any associated adopted regulations.

4.5.4 Alternative 1: Proposed Action

4.5.4.1 Direct and Indirect Impacts

Construction

Table 4.5-1 shows the GHG emissions estimated to be generated by CD-IV Project construction activities, which are expected to occur in two separate 8-month phases in 2013 and 2014, followed by 2 months of additional well development and pipeline work in 2015. As shown in Table 4.5-1, the CD-IV Project would generate a total of approximately 8,278 metric tons CO_2e. Refer to Section 4.5.1, *Methodology for Analysis*, for a discussion of the methods used to estimate each of the construction emissions sources.

TABLE 4.5-1
PROPOSED ACTION TOTAL GHG EMISSIONS FROM CONSTRUCTION

Construction Emissions Source	Construction Emissions (total metric tons)			
	CO_2	N_2O	CH_4	CO_2e
Power Plant - Off-road Equipment	284.8	<0.1	<0.1	287.3
Power Plant - On-road Vehicle	1,466.9	<0.1	0.2	1,480.5
Power Plant - Water Use	0.3	<0.1	<0.1	0.3
Power Plant - Subtotal	***1,751.9***	***<0.1***	***0.3***	***1,768.2***
Well Development - Off-road Equipment	2,688.2	0.1	0.2	2,712.6
Well Development - On-road Vehicle	3,131.0	<0.1	0.1	3,137.0
Well Development - Water Use	0.3	<0.1	<0.1	0.3
Well Development - Flow Testing	21.2	---	---	21.2
Well Development - Subtotal	***5,840.6***	***0.1***	***0.2***	***5,871.1***
Pipeline - Off-road Equipment	136.2	<0.1	<0.1	137.4
Pipeline - On-road Vehicle	495.1	<0.1	0.1	500.9
Pipeline - Water Use	0.8	<0.1	<0.1	0.8
Pipeline - Subtotal	**632.0**	**<0.1**	**0.1**	**639.1**
Grand Total (metric tons)	**8,224.5**	**0.1**	**0.6**	**8,278.4**

Operation and Maintenance

Direct and Indirect Emissions

Table 4.5-2 shows the estimated annual GHG emissions that would be directly and indirectly generated each year related to operation and maintenance of the CD-IV Project for fossil fuel combustion sources, fugitive SF_6 emission sources, non-condensable gas leaks at the power plants, and indirect emissions related to electricity and water usage. The total estimated annual operation and maintenance emissions that would be associated with the CD-IV Project is approximately 149 metric tons CO_2e. For a discussion of the methods used to estimate each of the operation and maintenance emissions sources, see Section 4.5.1, *Methodology for Analysis*.

TABLE 4.5-2
PROPOSED ACTION ANNUAL GHG EMISSIONS FROM OPERATIONS

Operational Sources	Annual CO_2e Emissions (metric tons)
On-road Vehicle Emissions	20.9
Emergency Stand-by Diesel Engines	13.2
Fugitive SF_6 Emissions	39.0
Non-Condensable Gas Leaks	75.6
Total Annual Operation GHG	**148.6**

Carbon Sequestration

Construction activities associated with the CD-IV Project would result in temporary and permanent losses of Jeffrey pine forest and Sagebrush Scrub, which sequester carbon on an annual basis. Construction of the power plant would require the disturbance of up to 6.5 acres of trees and other vegetation. An additional 0.25 acre would be cleared for construction of the substation. The transmission line connection from the power plant substation to the existing SCE Casa Diablo Substation would be approximately 500 feet long. Prior to construction, the alignment would be cleared of trees for an area wide enough to permit passage of trenching equipment and above ground transmission lines. As this vegetation currently acts as a carbon sink, its removal would diminish the amount of carbon sequestration that currently occurs on the Project site. However, the beneficial impacts of the CD-IV Project to offset GHG emissions from non-renewable energy sources would far exceed the impacts of altering the vegetation cover at the Project site (see *Fossil Fuel-Based Energy Displacement* discussion below).

Fossil Fuel-Based Energy Displacement

The proposed renewable source of energy that would be associated with the CD-IV Project could displace electricity generated by fossil fuel combustion with lower GHG-emitting electricity for consumers. The reduction in GHG emissions by electricity displacement was estimated by assuming that the CD-IV Project would displace electricity from the existing regional electric grid that includes electricity from fossil fuel-fired power plants, continuously over the 30 year life of the CD-IV Project. The CD-IV Project would have a net output of 33 MW and would run continuously, generating approximately 288,000 MWh annually. Overall, the CD-IV Project would be expected to displace over 89,000 metric tons of CO_2e per year, for the 30 year life of the CD-IV Project.

Decommissioning

The expected life of the proposed power plant operation is 30 years. At the end of the useful life of the CD-IV Project, equipment and facilities would be properly abandoned. Decommissioning would include dismantling the power plants and well fields. The geothermal wells would be abandoned in conformance with the well abandonment requirements of the USFS and 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. Decommissioning activities could generate temporary emissions of GHG similar to those that would occur during construction of the CD-IV Project (see above), with the exception that decommissioning activities would not likely require drilling.

Impact Summary

As described above, short-term CD-IV Project-related construction activities would result in much higher levels of GHG emissions compared to long-term operations of the CD-IV Project. Based on the emission estimates presented in Table 4.5-1 (above), the total emissions related to construction activities would be approximately 8,278 metric tons over approximately two years, which would be approximately 4,139 metric tons per year. This would be below USEPA's GHG mandatory emissions reporting threshold of 25,000 metric tons per year.

For a conservative analysis, this discussion also compares CD-IV Project emissions, including the total construction and decommissioning GHG emissions amortized over 30 years and added to the operation and maintenance emissions, to the USEPA's GHG mandatory emissions reporting threshold. As shown in Table 4.5-3, the sum of annual operation GHG emissions (including direct and indirect emissions) and the amortized construction and decommissioning GHG emissions would be up to 557 tons (505 metric tons) CO_2e per year, which would be below the USEPA's GHG mandatory emissions reporting threshold.

TABLE 4.5-3
PROPOSED ACTION TOTAL ANNUAL AMORTIZED GHG EMISSIONS

Emission Sources	Annual CO_2e Emissions	
	tons	**metric tons**
30-year Amortized Construction Emissions	304.2	275.9
Total Direct and Indirect Annual Operation Emissions	163.9	148.6
30-year Amortized Decommissioning Emissions	88.5	80.2
Amortized Construction + Annual Operation	**556.5**	**504.8**

SOURCES: ESA, 2012.

In addition, assuming that at full build-out the Project would produce approximately 288,000 MWh of electricity per year that would displace existing electricity on the regional electrical grid that includes electricity from fossil fuel-fired power plants, the Project would displace over 89,000 metric tons of CO_2e annually, resulting in a net reduction of over 88,000 metric tons CO_2e per year.

4.5.4.2 Climate Change Effects on the Project

In addition to global warming, climate change also is expected to result in a suite of additional potential changes that could affect the natural environment, including hydrologic resources (e.g., sea level rise and flooding), water resource availability, and impacts to biological resources. However, with possible exception of changes to the snowpack and the snowmelt period, given the nature and location of the CD-IV Project, the additional effects of climate change would not be expected to be relevant to the CD-IV Project.

Changes in snowpack and the snowmelt period are anticipated in California as a result of climate change (DWR, 2008, 2011). Specifically, climate change is expected to result in generally warmer temperatures, which in turn would result in a greater proportion of total annual precipitation falling as rain. Snowpack in California and the watersheds of the eastern Sierra Nevada serves as a temporary means of water storage, wherein water is released slowly and into the early summer during snowmelt. If a greater proportion of precipitation falls as rain, the snowpack would be reduced, and the potential for water storage within the snowpack would also be reduced.

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. In the event that climate change results in reduced snowpack within the Sierra Nevada, some degree of associated reduction in groundwater recharge of the geothermal system could occur. Although it is currently not possible to determine what effect reduced groundwater recharge would have on the geothermal system, this situation would not result in increased geothermal water requirements by the CD-IV Project, and would not result in additional geothermal water pumping during Project operations. Therefore, even with potential reductions in total groundwater recharge volume of the geothermal system associated with future climate change, no increase in geothermal fluid pumping would be required as a result of the effects of climate change.

4.5.4.3 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (construction, operation and maintenance, and decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.5.2.

a) *Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.*

As shown in Table 4.9-3, the sum of annual CD-IV Project operation and maintenance GHG emissions (including direct and indirect emissions) and the amortized CD-IV Project construction and decommissioning GHG emissions would be up to 557 tons (505 metric tons) CO_2e per year. This would be below the SCAQMD’s annual CO_2e CEQA threshold of 10,000 metric tons CO_2e. In addition, the CD-IV Project could displace electricity from the existing regional electrical grid that 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. Therefore, GHG emissions associated with the CD-IV Project would cause a less than significant effect on the environment.

b) *Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.*

The CD-IV Project has been evaluated relative to its potential to conflict with certain GHG reduction goals set forth in AB 32, including the 39 Recommended Actions identified by CARB in its Climate Change Scoping Plan. Table 3.5-1, *Recommended Actions of Climate Change*

Scoping Plan, presents the 39 Recommended Actions identified to date by CARB in its Climate Change Scoping Plan. Of the 39 measures identified, those that would be considered to be applicable to the CD-IV Project would primarily be those actions related to transportation, the RPS, and high global warming potential gases. Consistency of the CD-IV Project with these measures has been evaluated by each source-type measure below.

Scoping Plan Measure T-7: Heavy-Duty Vehicle GHG Emission Reduction (Aerodynamic Efficiency). This measure would require existing trucks and trailers to be retrofitted with the best available technology and/or CARB-approved technology. This measure has been identified as a Discrete Early Action, which means that it began to be enforceable starting in 2010. Technologies that reduce GHG emissions and improve the fuel efficiency of trucks may include devices that reduce aerodynamic drag and rolling resistance. The requirements apply to California and out-of-state registered trucks that travel to California. This measure requires fleet owners of in-use trucks and trailers to comply through a phase-in schedule starting in 2010 and achieve 100 percent compliance by 2014. Heavy-duty vehicles used for hauling during construction of the CD-IV Project would be required to be compliant with the regulations associated with Scoping Plan Measure T-7; therefore, the potential for the CD-IV Project to conflict with compliance of this recommended action would be negligible and associated impacts would be less than significant.

Scoping Plan Measure E-3: Renewables Portfolio Standard (RPS). The RPS promotes multiple objectives, including diversifying the electricity supply. Increasing the RPS to 33 percent is designed to accelerate the transformation of the electricity sector. The CD-IV Project would add renewable geothermal energy to the electricity supply, and so would be consistent with this recommended action.

Scoping Plan Measure H-6: High Global Warming Potential Gas Reductions from Stationary Sources – SF_6 Leak Reduction and Recycling in Electrical Applications. This measure would reduce emissions of SF_6 within the electric utility sector and at particle accelerators by requiring the use of best achievable control technology for the detection and repair of leaks and the recycling of SF_6. On June 17, 2011, the approved Final Regulation Order associated with Scoping Plan Measure H-6 for reducing SF_6 emissions from gas insulated switchgear became effective. The regulation establishes maximum annual SF_6 emission rates for gas insulated switchgear, starting in 2011 at 10 percent of the owners’ total equipment capacity. The emission rates will steadily decline by one percent per year until 2020, at which time the maximum annual SF_6 emission rate would be set at 1 percent. The regulation also requires gas insulated switchgear owners to annually report their SF_6 emissions and emission rate to CARB (CARB, 2011).

The CD-IV Project would include installation of new circuit breakers at each of the new OECs and GISs at each proposed production well pad. The SF_6-containing equipment was not assumed to be hermetically sealed to prevent the escape of SF_6 into the atmosphere because ORNI 50, LLC has not made a formal commitment to use hermetically sealed circuit breakers. Therefore, **Mitigation Measure GHG-1** (See Section 4.5.9 below) is recommended to ensure the use of hermetically sealed circuit breakers for the Project. Implementation of **Mitigation Measure GHG-1** would ensure that there would little potential for the CD-IV Project to conflict with compliance of this regulation and associated impacts would be less than significant.

4.5.5 Alternative 2: Plant Site Alternative

4.5.5.1 Direct and Indirect Impacts

Under this Alternative, the CD-IV power plant and related facilities would be located east of the existing Casa Diablo Geothermal Complex. Potential impacts to climate change would be similar in nature as described for the Proposed Action. Short-term construction and long-term operation and maintenance activities would result in similar overall GHG emissions compared to the construction emissions that would result for the Proposed Action (see Tables 4.5-1 through 4.5-3).

4.5.5.2 CEQA Significance Determination

Because emissions would be essentially the same for Alternative 2 compared with the Proposed Action, the CEQA significance determinations for Alternative 2 are the same as described above for the Proposed Action. Potential impacts of Alternative 2 would be less than significant.

4.5.6 Alternative 3: Modified Pipeline Alternative

4.5.6.1 Direct and Indirect Impacts

Construction and operation of the modified pipeline under Alternative 3 would result in substantially the same impacts to climate change as those identified for the Proposed Action (see Tables 4.5-1 through 4.5-3).

4.5.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 3 would be less than significant.

4.5.7 Alternative 4: No Action

4.5.7.1 Direct and Indirect Impacts

Under the No Action Alternative, long-term GHG emissions in the vicinity of the Project site would not be expected to change from existing conditions. Alternative 4 would not displace the generation of GHG emissions from existing fossil fuel-fired power plants compared to implementation of the Proposed Action.

However, drilling of authorized geothermal exploration wells, not part of the CD-IV Project in Basalt Canyon could continue resulting in similar short-term drilling-related GHG emissions as would occur under the Proposed Action (see Table 4.5-2).

4.5.7.2 CEQA Significance Determination

Alternative 4 would cause a less than significant impact and would provide no benefit related to GHG emissions.

4.5.8 Cumulative Impacts

GHG emissions are inherently a cumulative concern, in that the significance of GHG emissions is determined based on whether such emissions would have a cumulatively considerable impact on global climate change; therefore, the geographic scope of cumulative impacts related to GHG emissions and climate change is global. The CD-IV Project would result in short-term GHG emissions during construction and decommissioning and limited long-term GHG emissions during operations and maintenance, and would result in a long-term reduction of carbon sequestration at the site. However, the CD-IV Project could result in a long-term net reduction of approximately 88,000 metric tons CO_2e year by displacing electricity from fossil fuel-fired power plants, and therefore would not conflict with the state's GHG reduction goals. Virtually all of the cumulative projects described in Table 4.1-1, could contribute to global warming due to the generation of short-term and/or long-term GHG emissions. Table 4.5-4 below summarizes GHG emissions data for the CD-IV Project and available emissions data for cumulative projects, including the MP-I Replacement Project, which includes the replacement of an existing geothermal power plant, and the Snow Creek Phase III Project, which is proposes the development of 850 residential dwelling units, 400 hotel rooms/suites, and up to 75,000 square feet for non-residential uses on a total of approximately 237 acres. Overall, the CD-IV Project and MP-I Replacement Project offset GHG emissions through the generation of electricity from a renewable source while Snow Creek Phase III Project would generate modest GHG emissions, largely from vehicle traffic.

TABLE 4.5-4
CUMULATIVE GHG EMISSIONS

Project	Annual Amortized GHG Emissions (metric tons CO_2e)	GHG Offsets (metric tons CO_2e)
CD-IV Project[a]	505	88,000
MP-I Replacement[b]	NA[c]	75,000
Snow Creek Phase III[d]	8,851	0

NOTES:
a GHG emissions calculations and assumptions are provided in Appendix C.2.
b Mono County, 2012.
c Annual amortized GHG emissions for the MP-I Replacement Project are not available.
d Town of Mammoth Lakes, 2007.

4.5.9 Mitigation Measures

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.

4.5.10 Residual Impacts after Mitigation Incorporated

There would be no residual substantial impacts related to GHG emissions or climate change after mitigation has been incorporated.

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4.6 Cultural and Paleontological Resources

4.6.1 Methodology for Analysis for Cultural Resources

This section describes effects on cultural resources that have the potential to be caused by implementation of the CD-IV Project and Alternatives. The following discussion addresses potential environmental impacts associated with implementation of the Proposed Action and recommends measures to reduce or avoid adverse impacts anticipated from construction, operation, and decommissioning of the proposed CD-IV Project and Alternatives. A discussion of cumulative impacts related to cultural resources is also included in this section.

The purpose of this section is to provide evidence of the ongoing public process by which the BLM, USFS, and GBUAPCD are jointly complying with Federal, State, and local regulations to which each agency is variously subject. GBUAPCD is the lead agency for the purpose of complying with CEQA. The BLM is the lead agency for the purpose of complying with NEPA and has further obligations to comply with Section 106 of the National Historic Preservation Act of 1966, as amended [16 USC 470(f)] (NHPA), and other federal historic preservation programs.

The structure of the cultural resources analysis for the Proposed Action accommodates both the primary need of GBUAPCD to demonstrate, under CEQA, a consideration of the potential for the Project to affect cultural resources and the primary needs of the BLM to conduct similar analyses under NEPA and Section 106. The present analysis is intended to fulfill the largely parallel goals of the regulatory programs through the execution of analytic phases. Details of these phases follow below and provide the parameters of the present analysis.

1. The initial phase determined the appropriate geographic extent or Area of Potential Effects (APE) of the analysis for the Proposed Action and for each alternative action under consideration. The APE includes an area sufficient to accommodate all of the proposed Project facilities under consideration.

2. The second phase produced inventories of the cultural resources within the APE. MACTEC (2012) reported on a Class III cultural resource inventory of the APE in *A Class III Cultural Resources Inventory for the Basalt Canyon Project, Mono County, California.* The Bureau of Land Management, Bishop Field Office (Haverstock, 2012) performed additional survey, reported in *An Expanded Cultural Resources Inventory Report for the Proposed Casa Diablo IV Geothermal Project.* Figure 3.6-1 shows the extent of these surveys, which covered areas designated under Alternatives 1-3.

3. The third phase determined means to avoid cultural resources identified by the inventory during construction.

4. The fourth phase created a Memorandum of Agreement between interested and consulting parties, outlining the mechanisms for site avoidance.

5. The final phase creates an Historic Properties Avoidance Plan, incorporating avoidance measures, and details actions in case of inadvertent discoveries that would resolve significant impacts.

4.6.1.1 Cultural Resources Analysis under CEQA and the NHPA

A key part of a cultural resources analysis under CEQA, NEPA, and Section 106 is to determine which of those cultural resources that a proposed or alternative action may affect are important or historically significant. Note that each of these three regulatory programs uses slightly different terminology to refer to historically significant cultural resources. Clarifications on the use of the terms “historical resource,” “important historic and cultural aspects of our national heritage,” and “historic property” may be found in the Chapter 9, Glossary.

Inventory of Cultural Resources in Project Area of Analysis

A cultural resources inventory specific to each proposed or alternative action under consideration is a necessary step in the effort to determine whether each such action may; 1) under CEQA, cause a substantial adverse change in the significance of historical or unique archaeological resources; 2) under NEPA, affect important historic and cultural aspects of our national heritage; or 3), under Section 106, adversely affect any cultural resources that are listed in or are eligible for listing in the National Register of Historic Places (National Register).

The development of a cultural resources inventory entails working through a sequence of investigatory phases to establish the kinds and numbers of cultural resources within an APE. Background research identified cultural resources previously recorded and assessed the results of any geotechnical studies or environmental assessments completed for a Project site. Fieldwork collected primary data on newly discovered cultural resources within the APE. Post fieldwork analyses support the development of determinations of significance for the cultural resources that are found. The BLM, in coordination with USFS, led the effort for all tribal consultation and coordination, and consulted with the following Federally recognized tribes: Bishop Paiute Tribe; Utu Utu Gwaitu Paiute Tribe (Benton); Big Pine Paiute Tribe; and the non-Federally recognized tribe Mono Lake Kutzadika'a Paiute Indian Community. The purpose of the consultation was to identify any site to which the Tribes attach religious or cultural significance (within the APE, none were identified). The cultural resources studies conducted for the CD-IV Project are detailed in Chapter 3.6 of this EIS/EIR. Tables below summarize findings for reference.

National Register eligibility recommendations have been made for archaeological resources (see Table 4.6-1; Pacific Legacy, 2009; MACTEC, 2011; Haverstock, 2012). Formal concurrence has not yet been made by the USFS or the SHPO. For the purposes of this analysis, all resources without existing formal National Register eligibility determinations are assumed to be National Register eligible. Prehistoric resources will typically be evaluated for their contribution to the as-yet-defined Casa Diablo Obsidian National Register District.

Avoidance of cultural resources is always the preferred alternative. Table 4.6-1 also notes mechanisms for the Proposed Action and Alternatives to avoid sites (Proposed Action and Alternatives further discussed below).

TABLE 4.6-1
SUMMARY OF NATIONAL REGISTER ELIGIBILITY AND TREATMENT RECOMMENDATIONS FOR ARCHAEOLOGICAL SITES

Site Designation	NRHP Recommendation	Closest Project Component	Actions to Avoid and Recommendation
FS 05045200307 Prehistoric site	District contributor	existing road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
FS 05045100314 Prehistoric site	District contributor	well pad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
FS 05045200389 Prehistoric site	not elgibile		BLM determined that FS 05045200389 is not an archaeological site. No further treatment is required.
FS 05045200297a Prehistoric site	not eligible	pipeline	Recorded by MACTEC but does not meet BLM site definition. No further treatment is required.
FS 05045200297b Prehistoric site	P-District contributor	well pad & pipeline	BLM finds site boundaries smaller than MACTEC and site outside pipeline and well pad. Move pipeline within existing dirt road off site. Fence during construction and monitor.
FS 0504520024 Locus 391 Prehistoric and historic components	P-District contributor H-unevaluated	wellpad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
FS 05045200026 Prehistoric and historic components	P-District contributor H-not eligible	well pad, pipeline, roads	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor. Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
ACH-02 Prehistoric site			Site redefined by BLM as CD4-02 and CD4-03 (see below).
ACH-03 Prehistoric site	District contributor	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
ACH-04 Historic site	not eligible	wellpad	No treatment.
ACH-05 Prehistoric site	District contributor	pipeline & wellpad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
ACH-06 Prehistoric site	District contributor	wellpad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
ACH-07 Historic site	not eligible	pipeline	No treatment.
ACH-09 Prehistoric site	District contributor	existing road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
ACH-11 Prehistoric and historic components	P-District contributor H-not eligible	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor. No further treatment needed for historic component.
ACH-12 Historic site	not eligible	pipeline	No treatment.
ACH-13 Prehistoric site	District contributor	wellpad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.

TABLE 4.6-1 (Continued)
SUMMARY OF NATIONAL REGISTER ELIGIBILITY AND TREATMENT RECOMMENDATIONS FOR ARCHAEOLOGICAL SITES

Site Designation	NRHP Recommendation	Closest Project Component	Actions to Avoid and Recommendation
ACH-14 Historic site	unevaluated	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
ACH-15 Prehistoric and historic components	P-District contributor H-not eligible	wellpad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor. No further consideration for historic component.
ACH-16 Prehistoric site	District contributor	existing road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
ACH-17 FS 05045202199 Historic site	unevaluated	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S1 FS 05045202183 ACH-01	District contributor	existing road	No deposit in road based on previous testing. Fence road edges during construction.
CD4-S1H	not eligible	existing road	No treatment.
CD4-S2 FS 05045202184	District contributor	new road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
CD4-S2H Historic site	not eligible	existing road	No treatment.
CD4-S3 FS 05045202184	District contributor	pipeline	Limit construction of pipeline to existing pipeline corridor through site. Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S3H Historic site	not eligible	wellpad	No treatment.
CD4-S4 FS 0504520024 Locus 297	P-District contributor	well pad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S4H Historic site	eligible	existing road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
CD4-S5 Prehistoric site	District contributor	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S5H Historic site	not eligible	existing road	No treatment.
CD4-S6 Prehistoric site	District contributor	well pad	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S6H Historic site	not eligible	pipeline	No treatment.
CD4-S7 Prehistoric site	District contributor	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S7H FS 0504200024/ Locus ACH-8 Historic site	not eligible	existing road	No treatment.

TABLE 4.6-1 (Continued)
SUMMARY OF NATIONAL REGISTER ELIGIBILITY AND TREATMENT RECOMMENDATIONS FOR ARCHAEOLOGICAL SITES

Site Designation	NRHP Recommendation	Closest Project Component	Actions to Avoid and Recommendation
CD4-S8 Prehistoric site	District contributor	existing road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
CD4-S8H Historic site	eligible	existing road	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
CD4-S9 FS 05045200923 Prehistoric site	District contributor	existing road	No treatment. Continued use of existing paved road through site will not cause Project effects.
CD4-S10 Prehistoric site	District contributor	existing roads	Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
CD4-S11 Prehistoric site	District contributor	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S12 Prehistoric site	District contributor	one new road one existing road	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor. Monitor capping of the archaeological deposit within the roadway with geo-textile cloth and sterile soil.
FS 0504200024 Locus 297c (CD4-S13)/CD4-S13/14 Prehistoric site	District contributor	pipeline	Multiple recommendations: Monitor spanning of pipeline over site area; site area has exhausted data potential.
CD4-S15 FS 05045200297x Prehistoric and historic components	P-District contributor H-unevaluated	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S16 Prehistoric site	District contributor	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S17/H FS 05045202199 Prehistoric and historic components	P-District contributor H-unevaluated	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.
CD4-S18H Prehistoric and historic components	P-District contributor H-not eligible	pipeline	Alternative 3 is designed to avoid cultural resources. Fence during construction and monitor.

Evaluation of Cultural Resources in Project Area of Analysis

Evaluation of Historical Significance under CEQA

CEQA requires GBUAPCD, as a lead agency, to evaluate the historical significance of cultural resources by determining whether or not they meet several sets of specified criteria. Under CEQA, the definition of a historically significant cultural resource is that it is eligible for listing in the California Register, and such a cultural resource is referred to as a "historical resource," which is a "resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register," or "a resource listed in a local register of historical resources or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code," or "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, provided the agency's determination is supported by substantial evidence in light of the whole record" [CCR 14 § 15064.5(a)]. The term "historical resource" indicates a cultural resource that is historically significant and/or eligible for listing in the California Register of Historical Resources. A resource may also be considered a unique archaeological resource under CEQA.

Under CEQA, the CD-IV Project would have a significant impact on cultural resources if it would:

1. Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5;
2. Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5;
3. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
4. Disturb any human remains, including those interred outside of formal cemeteries.

Under all of these criteria, adverse changes and impacts include the following:

1. Physical, visual, or audible disturbance resulting from construction, operation, and development that would affect the integrity of a resource or the qualities that make it eligible for the California Register or National Register;
2. Exposure of cultural resources to vandalism or unauthorized collecting;
3. A substantial increase in the potential for erosion or other natural processes that could affect cultural resources;
4. Neglect of a cultural resource that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to a Native American tribe; or
5. Transfer, lease, or sale of a cultural resource out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the resource's historic significance.

Evaluation of Historical Significance under Section 106

Section 106 of NHPA (16 USC 470f) requires federal agencies to consider, in consultation with SHPO, Indian tribes, local governments, and other interested parties, the impacts of their undertakings on historic properties, which includes any historic district, site, building, structure, object, or properties of traditional religious and cultural importance to Native Americans that are included in or eligible for inclusion in the National Register. The NHPA established the Advisory

Council for Historic Preservation and State Offices of Historic Preservation to assist federal and State officials regarding matters related to historic preservation. Under Section 106, federal agencies are required to assess the effects of an undertaking on cultural resources to determine if they are adverse, and if so, to propose mitigation measures to resolve such impacts. Historic properties are those resources that are listed in or are eligible for listing in the National Register per the criteria listed at 36 CFR 60.4 (Advisory Council on Historic Preservation, 2000) and are presented in the next subsection below.

National Register of Historic Places Evaluation

36 CFR Part 800.3 discusses the consultation process. Section 800.4 sets out the steps a Federal agency must follow to identify historic properties. 36 CFR Part 800.4(c)(1) outlines the process for National Register eligibility determinations.

The Historic Sites, Buildings and Antiquities Act of 1935 required the survey, documentation, and maintenance of historic and archaeological sites in an effort to determine which resources commemorate and illustrate the history and prehistory of the United States. The NHPA expanded on this legislation and assigned the responsibility for carrying out this policy to the United States Department of the Interior, National Park Service (NPS). Per NPS regulations, 36 CFR Part 60.4, and guidance published by the NPS, National Register Bulletin, Number 15, How to Apply the National Register Criteria for Evaluation, different types of values embodied in districts, sites, buildings, structures, and objects are recognized. These values fall into the following categories:

1. ***Associate Value (Criteria A and B)*****:** Properties significant for their association with or linkage to events (Criterion A) or persons (Criterion B) important in the past.

2. ***Design or Construction Value (Criterion C)*****:** Properties significant as representatives of the man-made expression of culture or technology.

3. ***Information Value (Criterion D)*****:** Properties significant for their ability to yield important information about prehistory or history.

The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association. Cultural resources that are determined eligible for listing in the National Register, along with SHPO concurrence, are termed “historic properties” under Section 106, and are afforded the same protection as sites listed in the National Register. Sites that have not been evaluated for eligibility to the National Register are assumed eligible for Project purposes, until a formal evaluation can be completed.

Assessing Action Impacts

The core of a cultural resources analysis under CEQA, NEPA, or Section 106 is to assess the character of the impacts that a proposed or alternative action may have on cultural resources. The analysis takes into account three primary types of potential impacts which each of the above regulatory programs defines and handles in slightly different ways. The three types of potential impacts include direct, indirect, and cumulative impacts. Once the character of each potential effect of a proposed or alternative action has been assessed, CEQA requires of further assessment of whether such impact is significant (see CEQA Significance Criteria, above).

Direct and Indirect Impacts

Direct and indirect impacts are those that are more clearly and immediately attributable to the implementation of Proposed Action or Alternatives. Direct and indirect impacts are conceptually similar under CEQA and NHPA, although uses of the concepts vary somewhat, as detailed below.

Direct and Indirect Impacts under CEQA. For CEQA, the definitions of effects are provided in Section 15358 of the *CEQA Guidelines.* Impacts to cultural resources are those associated with CD-IV Project development, construction, and co-existence. Construction usually entails surface and subsurface disturbance of the ground, and direct impacts to archaeological resources may result from the immediate disturbance of the deposits, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, excavation, or demolition of overlying structures. Construction can have direct impacts on historic built-environment resources when those structures must be removed to make way for new structures or when the vibrations of construction impair the stability of historic structures nearby. New structures can have direct impacts on historic structures when the new structures are stylistically incompatible with their neighbors and the setting, and when the new structures produce a harmful effect to the materials or structural integrity of the historic structures, such as emissions or vibrations. Placing the proposed plant into this particular setting could have a direct impact on the integrity of association, setting, and feeling of nearby standing historic structures.

Generally speaking, indirect impacts to archaeological resources are those which may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource components due to improved accessibility. Similarly, historic structures can suffer indirect impacts when Project construction creates potentially damaging noise and vibration, improved accessibility and vandalism, or greater weather exposure.

Ground disturbance accompanying construction at a proposed plant site, along proposed linear facilities, and at a proposed lay-down area has the potential to directly impact subsurface archaeological resources that are unidentified at this time. The potential direct, physical impacts of the proposed construction on unknown archaeological resources are commensurate with the extent of ground disturbance entailed in the particular mode of construction.

Direct and Indirect Impacts under Section 106. Both direct and indirect impacts may be considered adverse effects under Section 106. The regulatory definition of “adverse effect,” pursuant to 36 CFR Section 800.3(1)(a), is “when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association…Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.”

Cumulative Impacts

Cumulative Impacts are also slightly different concepts under CEQA and Section 106.

Cumulative Impacts under CEQA. A cumulative impact under CEQA refers to a proposed project's incremental impacts considered over time and taken together with those of other, nearby, past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project (PRC § 21083; CCR 14 § 15064(h), 15065(a)(3), 15130, and 15355). Cumulative impacts to cultural resources in the project vicinity could occur if any other existing or proposed projects, in conjunction with the proposed project, had or would have impacts on cultural resources that, considered together, would be significant. The previous ground disturbance from prior projects and the ground disturbance related to the future construction of a proposed project and other proposed projects in the vicinity could have a cumulatively considerable effect on archaeological deposits, both prehistoric and historic. The alteration of the natural or cultural setting which could be caused by the construction and operation of a proposed project and other proposed projects in the vicinity could be cumulatively considerable, but may or may not be a significant impact to cultural resources.

Cumulative Impacts under Section 106. The Section 106 regulation makes explicit reference to cumulative impacts only in the context of a discussion of the criteria of adverse effect [36 CFR §800.5(a)(1)]. Cumulative impacts are largely undifferentiated as an aspect of the potential impacts of an undertaking. Such impacts are enumerated and resolved in conjunction with the consideration of direct and indirect impacts.

Assessing the Level of Severity of Action Impacts

Once the character of the impacts that Proposed Action or Alternatives may have on historically significant cultural resources has been determined, the severity of those impacts needs to be assessed. CEQA and Section 106 each have different definitions and tests that factor into decisions about how severe or how significant the impacts of particular actions may be. Assessing effects to National Register-eligible resources and cultural resources is typically accomplished through the consultation process.

Significant Impacts under CEQA

Under CEQA, "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" (PRC §21084.1). Thus, staff analyze whether a proposed project would cause a substantial adverse change in the significance of the subset of the historical resources in the cultural resources inventory for a project area that the proposed project demonstrably has the potential to effect. The degree of significance of an impact depends on:

1. The cultural resource impacted;
2. The nature of the resource's historical significance;
3. How the resource's historical significance is manifested physically and perceptually;

4. Appraisals of those aspects of the resource’s integrity that figure importantly in the manifestation of the resource’s historical significance; and how much the impact will change those integrity appraisals.

Adverse Effects under Section 106

In accordance with 36 CFR Part 800.5 of the ACHP’s implementing regulations, which describes criteria for adverse effects, impacts on cultural resources are considered significant if one or more of the following conditions would result from implementation of the proposed action:

An undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register. For the purpose of determining the type of effect, alteration to features of a property’s location, setting, or use may be relevant, depending on the property’s significant characteristics, and should be considered.

An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:

1. Physical destruction, damage, or alteration of all or part of the property
2. Isolation of the property from or alteration of the character of the property’s setting when that character contributes to the property’s qualification for the National Register
3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting
4. Neglect of the property, resulting in its deterioration or destruction
5. Transfer, lease, or sale of the property

Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property’s eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

Resolving Significant/Adverse Impacts

The final phase of a cultural resources analysis is the resolution of those impacts of a proposed or alternative action that have been found to be significant or adverse. The terminology used to describe the process of impacts resolution differs among the three regulatory programs. The resolution of significant impacts under CEQA involves the development and implementation of “mitigation measures,” which would minimize any such impacts (14 CCR § 15126.4). The Section 106 process directs the “resolution of adverse effects” through the development of proposals to avoid, minimize, or otherwise mitigate such effects [36 CFR § 800.6(a)].

4.6.2 Project Design Measures

The analysis assumes that the following PDMs related to cultural resources are fully implemented:

1. *CUL-1*: All grading and site construction activities will avoid all cultural resource sites identified in the cultural resource survey report prepared for the Project areas. If identified cultural resource sites cannot be avoided, ORNI 50, LLC will comply with all requirements of the BLM, USFS, and the SHPO prior to any grading or site construction activities that 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 an Inyo National Forest archaeologist, BLM 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.

4.6.3 Proposed Action

Proposed Action will occur in three Project phases: construction, operation and maintenance, and decommissioning. Construction requires clearing and grading of the temporary and permanent disturbance areas. Operations and maintenance includes day to day activities, and periodic maintenance and upgrade to existing equipment. Decommissioning of Proposed Action would include dismantling the power plant and well-field and restoring the site to pre-Project conditions.

4.6.3.1 Direct and Indirect Impacts

This analysis of direct and indirect impacts for the Proposed Action and various alternatives is organized according to Project phases noted above: construction; operation and maintenance; and decommissioning. Table 4.6-2 summarizes actions appropriate to each alternative, and also provides an analysis of the potential impacts to cultural resources for the Proposed Action and Alternatives. Alternatives 1-4 would have differing impacts to these resources, as Table 4.6-2 notes.

Modifications to the design of Alternative 1 have been made with the intent of avoiding direct physical impacts to most cultural resources within the footprint of the CD-IV Project. Impacts would still potentially occur to some archaeological sites (see Table 4.6-1) as well as to the resources contributing to the Casa Diablo Obsidian Quarry Archaeological District. Impacts from Alternative 2 are the same as Alternative 1. Alternative 3 would impact the fewest sites.

Construction

Construction could result in the direct impact to previously recorded and unanticipated cultural resources including damage and/or displacement of resources, resulting in the loss of information about history and prehistory.

TABLE 4.6-2
SUMMARY OF PROPOSED ACTION, ALTERNATIVES, AND IMPACTS

Action Type	Action	Impact to Resources
Alternative 1. Proposed Action		
Construction	Construction of Alternative 1 would require clearing and grading of the temporary and permanent disturbance areas.	Modifications to the design of Alternative 1 have been made with the intent of avoiding direct physical impacts to most cultural resources within the footprint of the CD-IV Project. Impacts would still potentially occur to sites within the APE as well as to sties associated with the National Register Historic District. Due to various surface conditions or changes over time, not all cultural resources are expressed on the surface. Any project with ground disturbing components has the potential to directly impact unanticipated cultural resources. The concentration of archaeological sites in the vicinity suggests that this potential exists in the APE. Construction of Alternative 1 may result in inadvertent discoveries of cultural resources. Implementation of the PDMs and Mitigation Measure CUL-8 would ensure that the worker training program reduce the risk of direct impacts to cultural resources within the Project APE and that work stop in the vicinity of an unanticipated discovery.
Operation and Maintenance	Day to day operations; periodic maintenance to existing equipment	The primary potential for direct impacts to cultural resources is from unanticipated damage or inadvertent discoveries. Because operation and maintenance activities would be limited to the approved construction footprint of Alternative 1, with the exception of roads maintained/plowed during Project operations that do not require upgrades or revisions during Project construction, no additional direct impacts to cultural resources are expected during operation and maintenance. During operation and maintenance, the PDMs and the MOA would reduce the risk of adverse impacts to cultural resources within the Project APE. Avoidance and protection of potentially significant resources during the operation and maintenance phase of the Project would protect cultural resources avoided by construction impacts.
Decommissioning	Decommissioning of Proposed Action would include dismantling the power plant and well-field and restoring the site to pre-Project conditions.	Because decommissioning activities are similar in nature to construction activities, the PDMs and mitigation measures developed for construction activities would be applied during the decommissioning phase, including protocols related to the protection of cultural resources from adverse impacts. With implementation of an MOA, decommissioning effects on any known or unknown historic and archaeological resources would be mitigated by ensuring identification, evaluation, avoidance, and protection of resources.
Alternative 2. Alternative Plant Location		
Construction	Construction of Alternative 2 would require clearing and grading of the temporary and permanent disturbance areas.	Both direct and indirect construction impacts for Alternative 2 are similar to Alternative 1.
Operation and Maintenance	Similar to Alternative 1.	Both direct and indirect operation and maintenance impacts for Alternative 2 are similar to Alternative 1.
Decommissioning	Similar to Alternative 1.	Both direct and indirect decommissioning impacts for Alternative 2 are similar to Alternative 1.
Alternative 3. Modified Pipeline Alternative		
Construction	Both direct and indirect construction impacts for Alternative 3 are similar to Alternative 1, the CD-IV Project. There is a reduction in the potential for unanticipated discoveries of cultural resources on Alternative 3 relative to the reduction in the operation and maintenance footprint compared to the Proposed Action.	Other than Alternative 4 (No Action), Alternative 3 would impact the fewest sites, as its design avoids cultural resources. There remain several locations at which Project facilities cross or overlap with historic properties. Engineering plans for CD-IV Project Alternative 3 have not been finalized, and minor adjustments to the Alternative 3 design can be made. There is considerably flexibility of location and design for most Project facilities (well pads, pipelines, new access roads, transmission line). Due to various surface conditions or changes over time, not all cultural resources are expressed on the surface. Any Project with ground disturbing components has the potential to directly impact unanticipated cultural resources. The concentration of archaeological sites in the vicinity suggests that this potential exists in the APE. Construction of Alternative 1 may result in inadvertent discoveries of cultural resources. Impacts would still potentially occur to sites within the APE as well as to the potential National Register Historic District.

TABLE 4.6-2 (Continued)
SUMMARY OF PROPOSED ACTION, ALTERNATIVES, AND IMPACTS

Action Type	Action	Impact to Resources
Alternative 3. Modified Pipeline Alternative (cont.)		
Operation and Maintenance	Similar to Alternative 1.	Both direct and indirect operation and maintenance impacts for Alternative 3 are similar to Alternative 1.
Decommissioning	Similar to Alternative 1.	Both direct and indirect decommissioning impacts for Alternative 3 are similar to Alternative 1.
Alternative 4. No Action		
Construction	No action	No Impact
Maintenance and Operation	No action	No Impact
Decommissioning	No Action	No Impact

Section 4.6.2 discusses project design measures implemented prior to construction, with the intent of avoiding cultural resources. Implementation of PDMs will avoid the surface of known archaeological sites, but some impacts potentially remain. **Mitigation Measures CUL-1 through CUL-8** (detailed below in Section 4.6.5) have been formulated to ensure that Project construction effects on cultural resources would be mitigated by ensuring identification, evaluation, avoidance, and protection of resources. Construction of all alternatives would also occur in full compliance with the PDMs (see Section 4.6.2, *Project Design Measures*).

A Memorandum of Agreement (MOA) will be negotiated through additional Section 106 consultation (**Mitigation Measure CUL-1**). A Historic Property Avoidance Plan will be developed as an appendix to the MOA.

Due to various surface conditions or changes over time, not all cultural resources are expressed on the surface. Any project with ground disturbing components has the potential to directly impact unanticipated cultural resources. The concentration of archaeological sites in the vicinity suggests that this potential exists in the APE. Construction of all alternatives may result in inadvertent discoveries of cultural resources. Based on the Section 106 Consultation process the BLM has determined that subsurface expressions of previously unrecorded sites and potential Historic District may be adversely affected by the implementation of the Proposed Project, and is consulting with SHPO, USFS, and the Tribes on means of reducing adverse effects. Implementation of the PDMs and **Mitigation Measure CUL-6** would ensure that the worker training program reduce the risk of direct impacts to cultural resources within the Project APE and that work stop in the vicinity of an unanticipated discovery. **Mitigation Measure CUL-8** would ensure continued consultation with Tribes and reduction of adverse effects to the potentially significant sites and/or a significant district.

Operation and Maintenance

The primary potential for direct impacts to cultural resources during the operation and maintenance phase is from unanticipated damage or inadvertent discoveries. Because operation and maintenance activities would be limited to the approved construction footprint of Alternative 1, with the exception of roads maintained/plowed during Project operations that do not require upgrades or revisions during Project construction, no additional direct impacts to cultural resources are expected during operation and maintenance. During operation and maintenance, the PDMs, Mitigation Measures CUL-1 through CUL-8, and the MOA would reduce the risk of adverse impacts to cultural resources within the Project APE. Avoidance and protection of potentially significant resources during the operation and maintenance phase of the Project through implementation of the Historic Properties Avoidance Plan would protect known cultural resources and sites inadvertently disturbed by construction impacts.

Decommissioning

Decommissioning of Proposed Action would include dismantling the power plant and well-field and restoring the site to pre-Project conditions. Because decommissioning activities are similar in nature to construction activities, the PDMs and mitigation measures developed for construction activities would be applied during the decommissioning phase, including protocols related to the protection of cultural resources from adverse impacts. With implementation of **Mitigation Measures CUL-1 through CUL-8**, decommissioning effects on any known or unknown historic and archaeological resources would be mitigated by ensuring identification, evaluation, avoidance, and protection of resources.

The primary potential for direct impacts to cultural resources during the decommissioning phase is from either unanticipated damage or inadvertent discoveries. The PDMs, Mitigation Measures CUL-1 through CUL-8, and the MOA would reduce the risk of direct impacts to cultural resources within the APE. Avoidance and protection of potentially significant resources during the decommissioning phase of the CD-IV Project would protect cultural resources originally avoided by construction impacts. Because decommissioning activities would be limited to approved construction footprints, no additional direct impacts to cultural resources are expected.

4.6.3.2 CEQA Significance Determination

This analysis of direct and indirect impacts for the Proposed Action is organized according to the following Project phases: construction; operation and maintenance; and decommissioning. Table 4.6-3 summarizes this information.

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented in the table based on the CEQA Significance Criteria presented in Section 4.2.2.

4.6.4 Cumulative Impacts

Cumulative impacts on cultural resources take into account the proposed action’s impacts as well as those likely to occur as a result of other existing, proposed and reasonably foreseeable projects. When analyzing cumulative impacts on cultural resources, an assessment is made of the impacts on individual resources as well as the inventory of cultural resources within the cumulative impact analysis area.

4.6.4.1 Geographic Extent/Context

The regulations implementing Section 106 of the NHPA expressly integrate consideration of cumulative concerns within the analysis of a proposed action’s potential direct and indirect effects by defining “adverse effect” to include “reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative” [36 CFR §800.5(a)(1)].

The geographic scope of the cumulative effects analysis for cultural resources is the APE and a five mile radius around the APE, which provides a reasonable context wherein cumulative actions could affect cultural resources. This is a large enough area to encompass any indirect effects of the CD-IV Project on cultural resources that may combine with similar effects caused by other projects.

TABLE 4.6-3
CEQA SIGNIFICANCE DETERMINATION

Criteria	Action Type	Action	Impact to Resources
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5	Construction	Construction would require clearing and grading of the temporary and permanent disturbance areas.	As described above, the Proposed Action could potentially impact known and not-yet-discovered historical resources (as defined in CCR 14 15064.5) during the construction phase. These impacts may be significant. Implementation of the MOA and HPMP, as well as implementation of the PDMs would reduce impacts to historical resources to a less-than-significant level.
	Operation and Maintenance	Day to day operations; periodic maintenance to existing equipment	As described above, the Proposed Action could potentially impact known and not-yet-discovered historical resources (as defined in CCR 14 15064.5) during the operation and maintenance of the CD-IV Project. These impacts may be significant. Implementation of mitigation measures to be defined in the Historic Properties Avoidance Plan, as well as implementation of the PDMs would reduce impacts to historical resources to a less-than-significant level.
	Decommissioning	Decommissioning of Proposed Action would include dismantling the power plant and well-field and restoring the site to pre-Project conditions.	As described above, the Proposed Action could impact historical resources (as defined in CCR 14 15064.5) during decommissioning of the CD-IV Project. Implementation of the Historic Properties Avoidance Plan and the PDMs would reduce impacts to historical resources to a less-than-significant level.
b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to § 15064.5	Construction	Similar to criterion a above.	As described above, the Proposed Action could impact unique archaeological resources [as defined in Section 21083.2(g)] during the construction phase. Implementation of the Historic Properties Avoidance Plan and the PDMs would reduce impacts to historical resources to a less-than-significant level.
	Operation and Maintenance	Similar to criterion a above.	As described above, the Proposed Action could impact unique archaeological resources [as defined in Section 21083.2(g)] during the operation and maintenance of the CD-IV Project. Implementation of the Historic Properties Avoidance Plan and the PDMs would reduce impacts to historical resources to a less-than-significant level.
	Decommissioning	Similar to criterion a above.	As described above, the Proposed Action could impact unique archaeological resources [as defined in Section 21083.2(g)] during the decommissioning of the CD-IV Project. Implementation of the Historic Properties Avoidance Plan and the PDMs would reduce impacts to historical resources to a less-than-significant level.
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature	This section is discussed elsewhere.		
d) Disturb any human remains, including those interred outside of formal cemeteries	Construction	Similar to criterion a above.	No known human remains are located within the CD-IV Project APE however this possibility cannot be entirely discounted. Impacts to human remains would be significant. Implementation of mitigation measures, to be defined in the Historic Properties Avoidance Plan during construction of the Proposed Action, as well as implementation of the PDMs would reduce impacts to human remains to a less-than-significant level.

TABLE 4.6-3 (Continued)
CEQA SIGNIFICANCE DETERMINATION

Criteria	Action Type	Action	Impact to Resources
d) Disturb any human remains, including those interred outside of formal cemeteries (cont.)	Maintenance and Operation	Similar to criterion a above.	No known human remains are located within the CD-IV Project APE however this possibility cannot be entirely discounted. Impacts to human remains would be significant. Implementation of mitigation measures, to be defined in the Historic Properties Avoidance Plan during construction of the Proposed Action, as well as implementation of the PDMs would reduce impacts to human remains to a less-than-significant level.
	Decommissioning	Similar to criterion a above.	No known human remains are located within the CD-IV Project APE however this possibility cannot be entirely discounted. Impacts to human remains would be significant. Implementation of mitigation measures, to be defined in the Historic Properties Avoidance Plan during construction of the Proposed Action, as well as implementation of the PDMs would reduce impacts to human remains to a less-than-significant level.

Determining the temporal scope requires estimating the length of time the effects of the proposed action will last, either individually or in combination with other anticipated effects. The temporal scope of impacts to cultural resources during development of cumulative projects along with the Proposed Action would be through the end of Project decommissioning, because any direct or indirect effects of the Project would only occur during the life of the Project.

4.6.4.2 Existing Cumulative Conditions

Cumulative conditions to cultural resources involve the disturbance of culturally significant resources, and alteration of the historic and cultural landscape of the area over time. Recreation, land management, and other land uses have had some cumulative effects on cultural resources. Examples are existing roadways that overlay archaeological sites, or existing roadways adjacent to archaeological sites, making them more accessible.

4.6.4.3 Reasonably Foreseeable Projects

Table 4.1-1 in Section 4.1 provides a listing of all the current and reasonably foreseeable projects, including other proposed or approved geothermal development projects, proposed or approved projects within Mono County's jurisdiction, and other actions/activities that the Lead Agencies consider reasonably foreseeable. Many of these projects have either undergone independent environmental review pursuant to CEQA or will do so prior to approval. Even if environmental review has not been completed for the projects described in Table 4.1-1, their effects were considered in the cumulative impacts analyses in this EIS/EIR for the geographic area described below in Section 4.6.7.1.

4.6.4.4 Construction

The CD-IV Project has been designed to avoid direct physical effects to most known archaeological resources; however, the Proposed Action may potentially adversely affect some significant historic properties and the proposed Casa Diablo Obsidian Quarry Archaeological District. As noted above, Alternative 3 would result in the least amount of direct physical effects. In addition, there is the potential for unanticipated damage or inadvertent discoveries of unknown resources during the construction phase of the CD-IV Project. If any unanticipated resources are encountered during construction, measures to reduce impacts to these resources would be implemented (as described in **Mitigation Measures CUL-1 to CUL-2**, below). Construction of other projects located in the geographic area for the cumulative analysis (described in Section 4.6.7.1, below) could also result in damage to known or previously unknown resources encountered during construction.

The CD-IV Project may contribute to adverse cumulative impacts on cultural resources. For instance, while direct impacts to historic properties can often be avoided, projects and activities in the vicinity of a historic property can alter the context of the resource by changing its surroundings, potentially degrading the value of the resource. Similarly, individual projects can contribute to the degradation of certain ethnographic values of an area simply by altering the landscape, particularly as related to Native American cultures, even if no cultural resources are directly affected. This could include alteration of important views, modification of traditional landscapes, or limitations on traditional uses of an area.

4.6.4.5 Operation and Maintenance

With implementation of the PDMs and Project-specific mitigation measures listed in Section 4.6.2 and 4.6.5 respectively, adverse effects on any known or unknown historic properties that could potentially be encountered during operation and maintenance activities would be mitigated by ensuring identification, evaluation, avoidance, and protection of those resources. Given these factors, the operation of the Proposed Action would not directly contribute to cumulative impacts on cultural resources within the geographic extent.

4.6.4.6 Decommissioning

Decommissioning of the CD-IV Project, consistent with an approved decommissioning plan, would greatly reduce any Project-related contributions to cumulative effects. In addition, it is unlikely that any unanticipated resources would be discovered during decommissioning activities, as such all cultural resources at the site would probably have been previously identified during either construction or operation. Therefore, CD-IV decommissioning would not contribute to any adverse cumulative impacts on cultural resources. In addition, with decommissioning and restoration, the CD-IV Project site would be restored to a condition similar to pre-construction conditions, and any effect that the Project may have on culturally important landscapes, views, or traditional uses of the area would be eliminated or substantially reduced.

4.6.4.7 CEQA Significance Determinations

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 2 would remain less than significant with mitigation.

4.6.5 Mitigation Measures

All alternatives (except Alternative 4: No Action) analyzed for this document have the potential to cause an adverse effect on significant cultural resources. In addition to the PDMs listed above, Project-specific mitigation measures have been developed to reduce and/or avoid potential cultural resources impacts associated with construction, operation, and decommissioning of the proposed CD-IV Project or an alternative. 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 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 Avoidance Plan; and 8) Tribal consultation and participation.

Mitigation Measure CUL-2: On the basis of preliminary National Register eligibility assessments made under the MOA, particularly concerning contributing resources to the Casa Diablo Obsidian National 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, Project redesign shall protect potentially National Register-eligible resources from direct Project impacts 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 Historic Properties Avoidance Plan shall be developed and included in the MOA that defines and maps all known cultural resources within 150 feet of the Project APE. That Plan shall also detail how resources will be marked and protected as Environmentally Sensitive Areas during construction. The Plan shall detail provisions for monitoring construction in locations deemed to be high-sensitivity areas for buried sites currently without surface manifestations. 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 Historic Properties Avoidance Plan 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 Historic Properties Avoidance Plan 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.

4.6.6 Residual Impacts after Mitigation Incorporated

Under the Proposed Action (Alternative 1), there remains a potential for adverse effects to previously undiscovered archaeological resources, as well contributing resources to the Casa Diablo Obsidian Quarry Archaeological District, which may be discovered during construction, operation and maintenance, and decommissioning. Implementation of the mitigation measures presented above will reduce impacts to cultural resources to a less-than-significant level for the purposes of CEQA and minimize adverse effects to known and previously unknown historic properties under NHPA. Alternative 3 of the CD-IV Project has been designed to avoid the majority of direct adverse effects to significant known cultural resources.

4.6.7 Proposed Action and Impacts, Paleontological Resources

4.6.7.1 Construction

Staging areas, work areas, and excavations associated with construction of the CD-IV Project could result in inadvertent damage to or destruction of fossils that would possibly be unique and/or scientifically important. The potential for disturbance of significant paleontological resources is generally limited to grading and excavation activities within previously undisturbed (i.e., in situ) sedimentary geologic units. As largely buried resources, the exact location or presence of fossils within undisturbed geologic units cannot always be determined, but the relative likelihood of encountering fossils can be estimated based on the paleontological potential of the rock unit, as determined in the affected environment (Section 3.6.3). As discussed in that section, the only area of the Project site that might be prone to impacts to paleontological resources would be the Pleistocene-age geologic units underlying proposed well sites 55-32 and 65-32 and the portion of the proposed well pipeline leading to those well sites, located south of the existing MP-II plant. Pleistocene-age alluvium has a PYFC Class 3, which identifies fossiliferous geologic units whose fossil content varies in significance, abundance, and predictable occurrence. Such units will have inconsistent occurrences of vertebrate fossils and significant nonvertebrate fossils the predictability is known to be low. In all other areas, including the proposed plant site, the potential presence of fossils is negligible or non-existent (PYFC Class 1) because the rocks are volcanic or glacial in origin.

Shallow excavations at well sites 55-32 and 65-32, or for footings associated with installation of the aboveground pipeline, both have the potential to yield yet unknown/undiscovered fossils of significance. The sensitive geologic unit (Pleistocene alluvium) is likely to occur only as a relatively thin veneer over older volcanic rocks deeper below ground. The sensitive area is thus limited in depth and extent as described above. Excavations required to construct the holding basin for drilling muds at well sites 55-32 and 65-32 could inadvertently encounter a paleontological resource. In addition, any excavation associated with the well-drilling itself, or installation of well drilling equipment, particularly closer to the surface, could also encounter a paleontological resource. As few fossils have been discovered within Pleistocene alluvium in the region and because the extent of excavation within the sensitive unit would be minor, the probability of encountering a fossil is very low.

Potential impacts to paleontological resources would be localized, minor and short-term.

4.6.7.2 Operation and Maintenance

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.

4.6.7.3 Decommissioning

Decommissioning activities would disturb the same areas already disturbed during construction. Hence, there would be no additional impacts related to paleontological resources during decommissioning. The impact would be minor.

4.7 Geothermal and Groundwater Resources

4.7.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives for geothermal and groundwater resources focuses on potential effects on geothermal resources that would result from implementation of the Proposed Action, such as changes in outflow to surface waters and geothermal manifestations, as well as potential for changes in cold/potable groundwater availability and water quality that could occur as a result of additional geothermal development. This analysis relies upon expert peer review of the Applicant’s proprietary simulation model of the geothermal reservoir and a comprehensive evaluation of the voluminous technical studies and monitoring data available for the Long Valley area since the beginning of existing geothermal operations. The technical study summarizing these findings, *Technical Geologic Overview of the Long Valley Caldera for the Casa Diablo IV Geothermal Development Project* (EGS, 2012) included as Appendix D, contains technical details and references.

4.7.1.1 Outflow to Surface Waters and Geothermal Manifestations

In order to assess the potential for increased geothermal development to substantially affect outflow of geothermal water to surface waters and geothermal manifestations in the Project vicinity, this analysis evaluates the hydrologic connection between these waters, historical response to existing geothermal production, the Applicant’s reservoir simulation model’s prediction of reservoir response to the proposed production increase, and the potential consequences of the reservoir response to geothermal fluid outflow. Effects on surface water quality and groundwater use related to above-ground construction and operational activities are discussed separately in Section 4.19, *Water Resources*.

4.7.1.2 Groundwater Resources

This analysis evaluates the potential for the Proposed Action to substantially affect the availability and quality of shallow cold groundwater resources based upon review of technical studies related to the geologic structure of Project area, historical monitoring of pressures in existing monitoring wells, and more recent chemical and isotopic analyses of water samples from the geothermal reservoir and shallow groundwater.

4.7.2 Project Design Measures

The analysis assumes that the following PDMs related to hydrologic resources would be fully implemented:

Geothermal Resources

1. *GEO-4*: 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 KGRA. ORNI 50 LLC also commits to operating the proposed geothermal project in conformance with these requirements.

4.7.3 CEQA Significance Criteria

CEQA Guidelines Appendix G does not explicitly specify potential significance criteria for geothermal resources. However, select hydrologic resources significance criteria would be applicable for groundwater resources and have been modified to include geothermal resources Therefore, based on CEQA Guidelines Appendix G, a project would cause adverse impacts to hydrologic resources, as relevant to geothermal resources, if it would:

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

b) Substantially deplete or alter geothermal outflow to surface water and geothermal manifestations

4.7.4 Alternative 1: Proposed Action

4.7.4.1 Direct and Indirect Impacts

This analysis of direct and indirect impacts for the Proposed Action is organized according to the following Project phases: construction; operation and maintenance; and decommissioning.

Outflow to Surface Waters and Geothermal Manifestations

As discussed in Section 3.7, roughly 70 percent of the current outflow from the geothermal reservoir occurs at Hot Creek on the southeastern edge of the Resurgent Dome (Figure 3.7-3). Geochemical, hydrological and thermal data from wells and springs in the southeastern caldera corroborate the continuity of geothermal fluid flow from Casa Diablo through Hot Creek and eastward to Lake Crowley and the comingling of shallow geothermal outflow and groundwater systems in the southern and southeastern caldera. Most of the prominent higher flow rate springs within the caldera occur within the southern caldera moat localized along faults within or around the southern edge or within the Resurgent Dome primarily at Casa Diablo, Hot Creek Gorge and Little Hot Creek (Figure 3.7-3). Thermal contributions to Hatchery Springs are estimated to provide approximately 5 percent of waters to the local Hot Creek Fish Hatchery. Hydrothermal manifestations are notably absent in the western caldera moat, with the exception of steam-heated features in the vicinity of Mammoth Mountain. Key geothermal features of concern within the caldera described in Section 3.7 include: Hot Creek Springs, Hot Bubbling Pool, Hot Creek Fish Hatchery, and thermal ground that occurs in several locations in the southern caldera moat.

Construction

Construction of the Proposed Action would not result in the ongoing withdrawal of geothermal fluid, nor other activities that could potentially deplete geothermal resources. Relatively small quantities of geothermal fluid with respect to the reservoir volume may be removed during flow testing of the wells, however, the potential effects on outflows to surface water and geothermal manifestations as a result of loss of geothermal fluid would be imperceptible.

Operation

Operation of the Proposed Action would increase the existing extraction of geothermal fluid from the Long Valley geothermal reservoir by approximately 50 percent. All of the produced geothermal fluid would be returned to the reservoir via reinjection, as it is now. The current average flow rate to the existing Casa Diablo plants is 12,000 gallons per minute (gpm), from both the Casa Diablo production wells and the two production wells (Wells 57-25 and 66-25) in Basalt Canyon. The CD-IV Project would expand production from Basalt Canyon by about 6,000 gpm to produce a total of 18,000 gpm from the reservoir. Because the geothermal reservoir has been shown to be connected to the surface waters and sensitive hot springs or other geothermal features in the south-southeastern caldera, these features may be affected by the additional development of the geothermal reservoir. However, historical monitoring data, modeling forecasts, and temperature of thermal features suggest that little change to the quantity, quality or temperature of these geothermal features would occur under the Proposed Action. Each of these lines of evidence is discussed below.

Findings from Historical Monitoring. The USGS and the LVHAC have investigated the shallow hydrologic system since the early 1980s. The data gathered from geothermal monitoring wells, shallow groundwater wells, and surface hydrologic features such as cold and hot springs and streams have been used to evaluate the potential effect of geothermal development on sensitive hot springs and other thermal features, surface water and groundwater quality. Historical data suggests that natural factors such as variations in precipitation, snow melt, groundwater recharge and magmatic activity have influenced the temperature and flow rate of surficial geothermal features to a greater extent than pressure reductions in the geothermal reservoir. The concentrations of non-reactive elements (such as chloride, boron, and fluoride) that have been used to track the origin, evolution, and circulation of geothermal fluids have remained stable in the reservoir, subsequent to an initial decline of 10 to 20 percent in chloride concentrations due to cold water influx during the early phases of geothermal production. Temperatures of produced geothermal fluids in Casa Diablo wells which also declined during that period have stabilized as well. Concentrations of non-reactive elements in hot springs which have been sampled over time (such as Hot Creek Springs) did not change significantly. The estimated rate of thermal water discharge at Hot Creek Gorge and water levels in nearby monitoring wells have varied little since 1988, despite several changes in geothermal production and injection, as well as local seismic and magmatic activity. Correlations between temperature and location of thermal water discharge and earthquakes in Long Valley were observed after the increase in seismic activity in 1980. Changes in the location and temperatures of thermal discharge that led to the closing of the Hot Creek swimming area in 2006 correlated with above- normal precipitation the preceding winter, and are not likely related to changes in geothermal production from Casa Diablo. Pressure variations in thermal and non-thermal monitoring wells (within a few miles east of Casa Diablo correlate with those in the production reservoir with only minor delays (days to weeks) in the arrival time of the pressure changes induced by changes in the production at Casa Diablo. While pressures in the Casa Diablo production zone decreased approximately 22 percent from the initial conditions through 2005, pressures increased by 7 percent after Basalt Canyon production began and Casa Diablo production was reduced in 2006 (for an overall net reduction of 15 psi). A deep monitoring well close (0.5 mile east) to Casa Diablo mimicked these changes by showing declines of approximately 8 percent between 1995 and 2005, and a rapid increase when some production was transferred to Basalt Canyon in 2006 to levels 3 percent above the 1995 levels. A shallow monitoring well about 3 miles east of Casa Diablo, CW3, showed a very slight decline in pressure of about 2.5 percent in response to Casa Diablo production. This pressure decline was recovered during the years of heavy precipitation between 1995 and 2000 and again when some production was transferred to Basalt Canyon, suggesting that at the pressure response of the shallow aquifer at this location is affected by both groundwater and Casa Diablo production. These distinct pressure variations are noted close to Casa Diablo but the effect attenuates with distance; pressure variations are not detectable as far east as Hot Creek. Water level measurements in well CH10B, located near Hot Creek Gorge, are not indicative of reservoir pressure changes related to geothermal development.

In the Basalt Canyon area, reservoir pressure appears to have declined approximately 10 psi, or about 2 percent, since the increase in production from that area began in 2006. Two monitoring wells were completed in the same zone that is being produced in the Basalt Canyon area (deep Bishop Tuff). Pressure declines of 2 percent were observed in one well in 2006, but this monitoring well had to be abandoned in 2007. In the second monitoring well, located north of Basalt Canyon, pressure declined 2.2 percent from 2006 to 2010 (EGS, 2012). It is worth noting that these observations occurred during a period in which there has been no injection of spent geothermal fluids in the Basalt Canyon area. The proposed CD-IV Project includes both production and injection in Basalt Canyon, therefore the long-term reservoir pressure response in the Basalt Canyon area cannot be quantified from the available monitoring data.

Numerical Model Forecasts. The Applicant has developed a proprietary numerical model of the geothermal reservoir that has been used to simulate geothermal production and predict reservoir response for the existing Casa Diablo geothermal developments. The Applicant's numerical simulation of the geothermal reservoir has been updated and used to forecast the geothermal reservoir response to the CD-IV Project. As part of this EIS/EIR analysis, the Applicant's model was subject to independent technical review by SAIC, Inc. to evaluate its validity for analyzing environmental impacts of the CD-IV Project. More specifically, the SAIC review considered the following aspects:

1) the soundness of the resource conceptual model
2) the appropriateness of model grid with respect to the geothermal field
3) the validity of boundary conditions
4) the quality of the initial state temperature and pressure match

5) the quality of the production history match
6) the reasonableness of model behavior during forecasts
7) overall quality of the model for simulating the response of the geothermal resource to expanded production

Because of the proprietary nature of the model described in the SAIC report, the SAICreport is confidential. However, SAIC concluded that there is good agreement between the model predictions and measurements and the model may be used to investigate the impact of future production scenarios on the reservoir pressures and temperatures. Model predictions of reservoir pressures and temperatures are discussed further below and in the technical study presented in Appendix D.

One function of the model is to forecast pressure and temperature declines at various locations in the reservoir. Results indicated that, over the life of the CD-IV Project with continued production from the existing Casa Diablo facilities, declines in reservoir pressure would range from 1.45 to 10.2 pounds per square inch (psi) (equivalent to 0.1 to 0.7 bar[1]). At the maximum level, this forecast pressure decline would be approximately 20 to 25 percent of the initial reservoir decline (after 1991 when production increased and injection changed to return spent fluid to the deeper Bishop Tuff reservoir). This forecast pressure decline would reduce the pressure in the Casa Diablo reservoir to levels observed between 1991 and 2006 (when some production was transferred to Basalt Canyon enabling a pressure increase in Casa Diablo). In comparison, the total reservoir pressure decline in the production zone from existing Casa Diablo geothermal production has been about 45 psi, of which 35 psi occurred in 1991 when production increased and injection changed and 15 psi was recovered when production was partially transferred. In contrast, the pressure in the Bishop Tuff in the Casa Diablo area increased 15 percent from initial conditions after injection began and is forecast to increase about half that much as a result of the CD-IV Project.

The produced temperature for existing geothermal wells is forecast to decline about 18^{o} F (10^{o}C) over the 30 year life of the CD-IV Project from the current temperatures ranging from about 340 to 356^{o} F (170 to 180^{o}C). The temperature of produced fluids at the Casa Diablo geothermal projects originally declined from initial conditions by approximately 21.6ºF (12ºC) by 1993 then stabilized along with the pressure. When production was partially transferred to Basalt Canyon, the combined temperature of produced fluids increased to close to initial conditions, partly because the Basalt Canyon fluids are hotter. The forecast temperature decline for Casa Diablo will be approximately the same or slightly higher as the initial decline (until 1993), producing temperatures at 2005 levels by 2045.

With the exception of Hatchery Springs (discussed further below), model simulation results did not predict a decline in thermal output to the hot springs from either existing geothermal production or expanded production under the CD-IV Project. Further, despite observed changes within the geothermal reservoir, the historical impacts of geothermal development at Casa Diablo

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1 One bar is an International System of Units (metric) unit of pressure that is about equal to the atmospheric pressure on Earth at sea level.

on the Long Valley hydrologic system, including the surface manifestations and groundwater resources discussed above, have not been significant. Therefore, because the effect of increased production under the CD-IV Project is anticipated to result in a smaller (pressure) or equivalent (temperature) change in geothermal reservoir conditions than has been observed to date, the CD-IV Project is unlikely to have a substantial adverse effect on the hydrologic system. In addition, the CD-IV Project wells would produce from a deeper, hotter portion of the reservoir than the existing shallow Casa Diablo production reservoir and located further from the comingled thermal and non-thermal hydrology around the Resurgent Dome, which would be expected to reduce potential effects on geothermal features sourced by shallow outflow related to declining reservoir pressures.

Temperature of Thermal Features. The chemistry of the thermal features collected as part of the LVHAC hydrologic monitoring suggests that the thermal features such as Hot Creek Spring and Hot Bubbling Pool are predominantly thermal water, with mixtures of groundwater. Mass balance calculations using chloride and temperature data[2] indicate that the shallow Casa Diablo aquifer is approximately 80 percent thermal water. Casa Diablo thermal water most likely mixes and boils (the Casa Diablo reservoir temperature is above boiling and would boil at the surface; both Hot Creek and the Hot Bubbling Pool are below boiling temperature at the surface) before discharging at the surface. Hot Creek and Hot Bubbling Pool waters, appear to be approximately 80 percent and 90 percent Casa Diablo thermal aquifer and 20 percent to 10 percent cold groundwater[3]. Despite cooling by mixing of cold and thermal water, as long as the mixed fluid which feeds the spring remains above the surface boiling temperature (as is the case at Hot Creek and Hot Bubbling Pool and nearby features), the actual discharge surface temperature remains at the boiling temperature (approximately 200ºF or 93ºC at 7000 feet, the elevation of Hot Creek) regardless of changes in the relative proportions of thermal water component or groundwater component. Therefore, the major surface manifestations are unlikely to be affected by changes in reservoir temperature as much as the geothermal waters are affected. However, at lower forecast temperatures of thermal inflow from the Casa Diablo reservoir (predicted to be up to 18ºF or 10ºC lower than current), there would be slightly lower inflow temperatures and slightly less (approximately 2 percent) steam at the surface.

Summary of Effects on Sensitive Geothermal Features. Based on response to reservoir pressure changes observed from historical monitoring and numerical model forecasts, the impact of the Proposed Action is not anticipated to have a substantial effect on outflow to surface waters and geothermal manifestations. Effects on specific sensitive geothermal resources are described below:

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[2] Mass balance calculations assume that thermal reservoir at Casa Diablo is represented by Monitoring Well MBP-3, a geothermal monitoring well sampled by the USGS (230 mg/L chloride, 316.4 ºF or 158 ºC) and the geothermal upflow is represented by Monitoring Well 44-16 (283 mg/L chloride, 392 ºF or 200 ºC),

[3] This estimate comes from a mass balance which is based on chloride which is undetectable in cold water and the assumption that any chloride is the result of geothermal fluid and a reduction in chloride is the result of cold water. Therefore the difference between 283 mg/L at 44-16 and 230 mg/L in geothermal fluids at MPB-3 is (1-(230/283)), or about 20 percent. If (1-230/283) is water at 15 ºC and (230/283) is 200 ºC, then the temperature of the mixture is (15x(1-(230/283))+(200x(230/283)=157.5 which is approximately 158 ºC, the measured temperature of the Casa Diablo mixture. This same calculation can be done at Hot Creek after the correction for the concentration of the fluids discharging at Hot Creek and Hot Bubbling Pool for boiling.

***Hot Creek Springs*:** Observed variations have primarily correlated with seismic activity and variations in rainfall, and were not explicitly attributable to historic changes in production associated with prior operations at Casa Diablo facilities. Therefore, as discussed above, the CD-IV Project is unlikely to significantly affect the temperature of Hot Creek Springs. Assuming that the thermal discharge from Casa Diablo cools up to 11 to 18ºF (6 to 10^{o}C) as forecast by the model, the discharge at Hot Creek could produce slightly less steam.

***Hot Bubbling Pool*:** A hot bubbling pool, which is located approximately 5 km east of the existing Casa Diablo facilities, experienced a 3.9 foot (1.2 m) water level decline concurrent with the onset of expanded geothermal fluid production and deeper injection in 1991. Subsequent to the change in geothermal production westward to Basalt Canyon in 2006, the water level has nearly recovered. Since the CD-IV Project is projected to have only 20 percent of the historical reservoir pressure changes in Casa Diablo and related changes in production and injection would occur primarily in the deeper zone in Basalt Canyon (and to a lesser extend injection in the deeper zone in Casa Diablo), substantial changes in water levels are not anticipated.

***Hot Creek Fish Hatchery*:** Recent studies of spring flow, temperature and water chemistry at the Fish Hatchery have shown that minimal temperature changes have occurred in the mixed thermal and non-thermal warm springs in response to geothermal development at Casa Diablo. Changes in discharge occurred during 1984 and 1995 when alterations in the geothermal production scheme occurred at the same time that the region also experienced a long-term drought, which affected all parts of the hydrologic system. Monitoring of hot spring inlet temperatures show variations seasonally as well as with longer periods of drought and heavy precipitation. Total net changes in temperature at the two main Hot Creek Fish Hatchery springs during the most significant period of geothermal development at Casa Diablo (1988-2003) were less than 2ºF (1.1^{o}C). Although greater temporary temperature declines have occurred during this time period approximately 4°F (2.2^{o}C) in 1995), these changes were apparently related to high winter precipitation, greater snow melt runoff, and higher than normal cold groundwater flow rates during the spring and summer. Furthermore, changes in hot spring inlet temperatures have not been accompanied by changes in chemistry which would indicate a change in thermal inflow, suggesting that heat in the rocks is buffering temperature of inflow to the hot springs (by conductive heating rather than the conductive cooling observed along the inflow to Little Hot Creek springs). Thus it is difficult to identify the smaller effects of geothermal development on the Hatchery springs relative to natural climatic effects and subsurface heat transfer because climatic variations and geothermal reservoir changes have both occurred simultaneously. Hatchery spring temperatures are apparently buffered by conductive heat from hot rocks in the subsurface to water along the water’s flow path, thus buffering potential impacts on temperature from changes in thermal water discharge.

Although the CD-IV Project is forecast to reduce the thermal outflow to Hatchery Springs by about 17 percent, the thermal water fraction is a very small part (less than 5 percent) of the total flow, so the impact to the combined cold and thermal discharge at the springs is forecast to be reduced by 0.85 percent and is not likely to be measureable relative to climatic effects. In addition, conductive buffering of the temperature would minimize potential temperature changes making such changes difficult to detect.

Little Hot Creek**:** The Little Hot Creek Springs discharge below boiling temperatures at a maximum of approximately 176ºF (80ºC) and there is no evidence of boiling. Using chloride concentrations[4] as for Hot Creek above, the mass balance indicates that these springs discharge a mixture of about 70 to 75 percent thermal water and 25 to 30 percent cold water. The temperature of Little Hot Creek Springs, however, is not 70 to 75 percent of the temperature of thermal water. This suggests that there has been significant conductive cooling as well as mixing between Casa Diablo and Little Hot Creek, which dampens the effect of Casa Diablo reservoir changes. No significant changes in flow or temperature at Little Hot Creek were reported by the USGS Long Valley monitoring program during the period when significant changes in reservoir temperature and pressure occurred in Casa Diablo from initial conditions after the increase in production and deepening of injection in 1991. This suggests that the smaller increases forecast for the CD-IV Project will not generate significant changes at Little Hot Creek.

Thermal ground**:** Thermal ground occurs in several locations in the southern caldera moat related to active or reactivated fumarolic areas or older broad altered zones of nutrient-poor, clay-rich soils. Several relict mudpots and fumaroles at Casa Diablo became active after earthquake swarms of the 1980's and as production increased and reservoir pressure declined in 1991. Some of the reactivated springs or fumaroles occur at considerable distances and higher elevations along major controlling fault zones around Casa Diablo and farther west in the caldera moat. Although the increased steam output is partly related to shallow geothermal reservoir pressure declines, two-phase conditions and steam migration from the shallow heated groundwater system, volcanic, and related seismic activity can also produce increases in steam-affected ground. 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 gas flow and tree deaths were not related to geothermal production from Casa Diablo but were an apparent response to potential magmatic input around Mammoth Mountain after 1990. The rapid onset of dying trees was apparently related to carbon dioxide interfering with nutrient uptake through the tree roots. Although carbon dioxide outflow and stressed vegetation is a natural consequence of shallow outflow, the lack of vegetation does not signify currently active thermal ground or elevated carbon dioxide emissions. Hydrothermally altered soils are clay-rich, depleted in nutrients and relatively high in trace element concentrations that inhibit vegetation growth. The prominent altered areas like the major fault zones that define the caldera margin and the relict fumarolic mounds around Shady Rest are bare because of alteration, not specifically because of increased thermal ground.

Fewer shallow geothermal effects are anticipated with increased production from Basalt Canyon under the proposed CD-IV Project. The geothermal fluid production (extraction) wells under the proposed Action would be drilled approximately 2-3 times deeper than the existing Casa Diablo wells. Thus, the CD-IV Project will increase production of geothermal fluid from the deeper Basalt Canyon reservoir, which is physically separated from the surface, effectively buffering changes in heat flow to the surface and limiting or preventing gas loss to shallower levels. Two phase steam/water conditions are not anticipated in the deeper production reservoir, and it is

[4] Chloride concentrations of 200 mg/L at Little Hot Creek USGS Monitoring station.

unlikely that any steam would reach the ground surface through the low permeability landslide block that underlies that Basalt Canyon area. Shifting production away from the shallow Casa Diablo reservoir is not expected to result in any additional thermal ground, and may reduce some of the steam increases at Casa Diablo related to earlier pressure declines. Therefore, increasing geothermal fluid production and injection in the lower geothermal reservoir is not anticipated to cause adverse impacts to springs, surface waters, and other geothermally related hydrologic surface features. Existing hydrologic monitoring programs under the oversight of the LVHAC would be evaluated by the USGS and all LVHAC members and expanded, as needed, to ensure monitoring adequately addresses the Proposed Action. Additional monitoring may include, but is not limited to, the following: drilling of additional monitoring wells; installation of new or updated monitoring equipment; monitoring of additional thermal and non-thermal springs, fumaroles, shallow groundwater wells, or geothermal wells; additional geochemical analyses. Continued compliance with the LVHAC monitoring, including monitoring determined necessary by the LVHAC for assessment of the CD-IV Project, would be required by BLM as permit Conditions of Approval[5] of the Project and would be part of a mitigation and monitoring plan. Permit conditions for existing geothermal projects require compliance with the hydrologic monitoring program and establish required mitigation actions if pressure, temperature and/or chemical changes or trends are occurring in excess of the anticipated variations. Permit conditions for the CD-IV Project would be established by the BLM in consultation with the LVHAC and USGS recommendations.

Decommissioning

Decommissioning of the proposed Action would result in the removal of existing facilities and the proper abandonment of existing geothermal wells. All geothermal power production and geothermal fluid extraction activities that would occur under the Proposed Action conditions would cease. No additional geothermal fluid would be extracted, and no new facilities would be constructed. The geothermal reservoir may recover some of the pressure and temperature declines forecast by the numerical model for the Proposed Action. As discussed above, the changes in temperature and outflow at the springs and other related geothermal surface manifestations except those close (less than 3.1 miles or 5 km) are largely attributed to climactic, seismic and magmatic changes and not to changes in reservoir pressures and temperature. However, at the time of the increase in production and deepening of injection at Casa Diablo in 1991, there were changes in reservoir pressure and temperature and corresponding changes in the surface manifestations closest to Casa Diablo (Hot Bubbling Pool). However, with the transfer of some production to Basalt Canyon in 2006, the changes were reversed. Because the predicted geothermal reservoir pressure and temperature declines under the CD-IV Project are expected to be less that those after 1991, any changes from the CD-IV Project are expected to be less. Furthermore, because both the reservoir changes and changes to Hot Bubbling Pool appear to be reversible after the recovery or partial recovery of reservoir pressure and temperature, any changes in surface manifestations close to Casa Diablo are anticipated to be reversed.

[5] As described in Section 1.2, Agency Roles, Permits, and Decisions, the Agencies' may issue a Record of Decision to approve a permit with conditions, known as Conditions of Approval.

Groundwater Resources

Construction

Drilling of geothermal production and injection wells to depths of up to 2,500 feet in the geothermal reservoir would require drilling through the shallow groundwater aquifer. As discussed in the project description, all wells will be cased to a depth below the lowest groundwater aquifer to prevent commingling of fluids in the wells. The use of casing would seal the upper groundwater aquifer and prevent communication between the overlying shallow aquifer and the deep geothermal reservoir. Casing installation would be performed according to industry standards and well permit specifications. The potential effect on groundwater resources from drilling and installation of geothermal production and injection wells is considered to be low.

Construction period shallow groundwater use is discussed in Section 4.19, *Water Resources*. No further discussion is warranted.

Operation

Operation of the Proposed Action is anticipated to have little to no effect on the availability and quality of groundwater resources used for drinking water supply. This conclusion is supported by the following: geologic features that physically separate the geothermal aquifer from groundwater resources; the lack of response in shallow groundwater wells to pressure changes in the geothermal reservoir; temperature; the chemical signature of the groundwater and geothermal water composition; and isotope data that indicates different recharge sources for the groundwater and geothermal aquifer. These factors are discussed below.

Geologic Setting. As discussed in Section 3.7, the MCWD produces water from nine water production wells located in the western part of the caldera that are spatially and vertically separated from the geothermal wells located further east (see Section 3.19, *Water Resources*). Shallow non-thermal groundwater in the Mammoth Groundwater Basin is generally colder (approximately 12.5-16ºF or 7-9^{o}C), shallower (82 –869 feet or 25-265m) and constrained to shallow glacial till, alluvium/colluviums and interbedded basalts/andesites relative to the geothermal system north and east. These rocks which host the cold groundwater aquifers, unconformably overlie the rocks of the geothermal system.[2] Cold groundwater aquifers used by MCWD are separated from the deeper, hotter geothermal system by intense alteration of upper Early Rhyolite units below the unconformity[2] in the western caldera to mostly impermeable clays. The geologic cross-section of the Mammoth Groundwater Basin presented in the MCWD groundwater model (Wildermuth, 2009) shows the location of the unconformity[6] observed during well drilling which separates the cold groundwater aquifers and the underlying geothermal system (Figure 3.7-6). Deep drilling results have shown that the Early Rhyolite units are more extensive than assumed from surface mapping (EGS, 2012). The intensely altered mix of ash and flows constitute a generally impermeable barrier between the groundwater aquifer and the underlying geothermal reservoir.

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6 An unconformity is a substantial break or gap in the geologic record where a rock unit is overlain by another that is not next in the stratigraphic sequence. The landslide block is an example of an unconformity.

Pressure Histories. Monitoring as part of the LVHAC includes 3 shallow non-thermal groundwater wells in the Mammoth Groundwater Basin. Historical pressure readings at these monitored wells show little response to noticeable pressure changes within the geothermal reservoir. Pressure histories of the individual shallow groundwater wells tend to reflect proximity to recharge sources, seasonal variations, and the hydrologic characteristics of varying geologic units. The observed monitoring does not indicate a connection of the shallow groundwater with the underlying deep geothermal reservoir.

Currently groundwater generally flows with the topography from Mammoth Mountain to the east. Closest to Mammoth Mountain, where the cold groundwater aquifer rocks are the thickest, the water levels are at the highest elevations. The geothermal monitoring wells furthest west (e.g. RDO-8) also have higher water levels, but not as high as in the cold groundwater wells suggesting that there is a pressure separation between the systems which decreases to the east (Sorey, 2003).

Several shallow geothermal exploration holes encountered warm (40 to 70°C) water in on the north side of the Mammoth Groundwater Basin north of Mammoth Creek within the same aquifer rocks as the cold groundwater aquifers. Some of the MCWD monitoring wells have temperatures between 9 to18ºF (5 to10ºC) warmer than the typical wells albeit without the chemistry of the deep geothermal system. If the pressure within the cold groundwater aquifer declines due to extensive pumping, it is possible that warm water from these wells could flow towards the MCWD cold groundwater wells, but it is likely to affect only the temperatures as the chemistry of these shallow warm waters is similar to the other MCWD wells and not like the geothermal system.

Geochemistry. 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 display nearly constant ratios of chloride to boron and chloride to bromide, which indicates a common water source beneath the Rhyolite Plateau. Although a few shallow groundwater wells have chloride/boron ratios typical of geothermal wells (greater than 20), the absolute boron concentration in groundwaters is small (less than 2 percent of that in high enthalpy geothermal waters) and very near the reporting level for laboratory analysis of these elements, therefore the chloride/boron ratios of groundwater are not indicative of the origin of the low chloride levels in the cold groundwaters. In addition, chloride concentrations of 250 mg/L typical of high temperature deep geothermal water have not been detected in the shallow groundwater wells of the Mammoth Groundwater Basin. Very low concentrations of chloride (2 to 5 mg/L) detected in samples from one isolated well (Well P-17) provide inconclusive evidence of a contribution of geothermal water in this one well; however, if the source of the chloride is thermal water, the maximum thermal contribution to the groundwater would be very small (1-2 percent).

Temperatures. As discussed above, the temperature of water in the shallow cold aquifer and the underlying geothermal reservoir vary widely, from about 46.4 ºF (8^{o}C) in the shallow waters to over 374ºF (190 ^{o}C) in the geothermal reservoir. Five MCWD wells along the northwestern side of the basin display elevated water temperatures relative to the rest of the basin. These slightly warm MCWD wells border the Rhyolite Plateau and the central part of the deeper geothermal source reservoir in the western caldera. Three temperature gradient boreholes drilled to 1,509 – 2,182 feet (460-665 meters) in the western caldera encountered maximum temperatures of 167 to 185ºF (75 to 85ºC). No chemical analyses were available for the temperature gradient wells, but analysis of the groundwater wells indicates that in only one well (Well P-17 discussed above) there is a possible indication that there may be a very small thermal component. Based on geochemistry of most of these wells, the slightly warmer temperatures in groundwater wells in the northwestern portion of the Mammoth Groundwater Basin do not appear to be the result of upward flow of hot geothermal fluid into the groundwater basin, but instead are likely the result of a conductive transfer of heat to the groundwater as it flows through the area of high heat at the periphery of the geothermal system in the western caldera moat.

Isotopic Data. Analyses and comparisons of light stable isotopes deuterium (D) and oxygen-18 from Long Valley show that cold groundwater recharge for the Mammoth Groundwater Basin aquifers originates from several sources: snowmelt infiltration at the southern and eastern bases of Mammoth Mountain; seepage from the upper reaches of Mammoth Creek; and snowmelt that flows through coarse-grained glacial deposits south of the caldera floor (e.g. along Sherwin Creek). These aquifers are located in alluvium/colluvium, shallow glacial tills, and moat basalt. In contrast, oxygen-18 and deuterium values for hot water flowing in the geothermal reservoir beneath the western part of the caldera indicate that such water originates 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. Because the isotopic signature of the cold shallow groundwater and the geothermal waters is distinct and unique, these data indicate that there is no influx of geothermal water into shallow groundwater in the western part of the caldera. Stable isotopic compositions of cold groundwaters in the Mammoth Basin plot almost exactly on the meteoric water line, with no suggestion of measureable influence from geothermal fluids (Figure 3.7-7). In summary, chemical data do not show consistent evidence for mixing between thermal and non-thermal waters beneath the western part of Long Valley caldera (Sorey, 2011b).

Summary. Available evidence indicates that the shallow Mammoth Groundwater Basin is physically isolated from the deeper geothermal system. Because these two systems are separate, the CD-IV Project would be unlikely to affect the availability or quality of shallow groundwater resources in the Project vicinity. No effects on the shallow cold water basin have been observed during monitoring of the 27 years of operation of the existing Casa Diablo facilities. Further, even if there are connections, the forecast pressure declines are unlikely to cause adverse impacts to the overlying groundwater system. In addition, producing from the deeper Basalt Canyon geothermal reservoir proposed under the CD-IV Project would have less potential to adversely affect shallow groundwater resources.

Despite the location of the shallow Mammoth Groundwater Basin in a geologically active area with variable annual precipitation (recharge) and regardless of the source of the low levels of chloride and temperature, current groundwater quality and quantity are within acceptable drinking water standards. The model forecasts of the geothermal reservoir response to CD-IV expansion of geothermal development are a very slight pressure decline and temperature decline. Therefore, it is unlikely that the CD-IV Project will affect the current groundwater quality. As discussed above, the existing hydrologic monitoring programs under the oversight of the LVHAC would be evaluated by the USGS and expanded as needed to ensure monitoring adequately addresses the proposed Action, including its potential to affect groundwater resources. Additional monitoring may include, but is not limited to, the following: drilling of additional monitoring wells; installation of new or updated monitoring equipment; monitoring of additional thermal and non-thermal springs, fumaroles, shallow groundwater wells, or geothermal wells; additional geochemical analyses. Continued compliance with the LVHAC monitoring, including additional monitoring determined necessary by the LVHAC for assessment of the CD-IV Project, would be required by the USFS and BLM as Conditions of Approval of the Project.

Decommissioning

Decommissioning of the Proposed Action would result in the discontinuation of all geothermal fluid extraction and injection activities associated with the Proposed Action. For the reasons outlined above, these actions would not be anticipated to affect shallow groundwater resources. Closure and abandonment of geothermal production and injection wells would be performed in accordance with well closure permits and standard industry procedures that would minimize the potential for effects on the overlying shallow aquifer. Potential effects on shallow groundwater would be minimal.

4.7.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented previously.

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

Construction

Construction period groundwater use is discussed in Section 4.19, *Water Resources*. No further discussion is warranted. As discussed above under Groundwater Resources, drilling of production and injection wells would involve the installation of casing to prevent commingling of fluids between the groundwater supplies and the geothermal aquifer, therefore, construction of the CD-IV Project would not affect shallow groundwater availability and quality. The impact would be less than significant.

Operation and Maintenance

As discussed above under Groundwater Resources, available evidence indicates that the groundwater aquifer used for drinking water supplies is physically separate from the underlying hot geothermal reservoir. Production and injection of geothermal fluid at depths of 1,600 to

2,500 feet (487.7 to 762 m) would not substantially affect the availability or quality of the groundwater supplies, therefore, this impact would be less than significant.

Decommissioning

No change in groundwater supplies is anticipated as a result of decommissioning, therefore, this impact would be less than significant.

Mitigation: None Required.

b) Substantially deplete or alter geothermal outflow to surface water and geothermal manifestations.

Construction

As discussed previously under Geothermal Resources, construction of the Proposed Action would not result in the ongoing withdrawal of geothermal fluid, nor other activities that could potentially deplete geothermal resources. Relatively small quantities of geothermal fluid with respect to the reservoir volume may be removed during flow testing of the wells, however, the potential effects on outflow to surface water and geothermal manifestations as a result of loss of geothermal fluid would be imperceptible and less than significant.

Operation and Maintenance

As discussed above under Geothermal Resources, increasing geothermal fluid production in the geothermal reservoir is not anticipated to cause noticeable impacts to springs, surface waters, and other hydrologic surface features. Existing monitoring programs under the oversight of the Long Valley Hydrologic Advisory Committee would be expanded to include monitoring for the proposed Action, in accordance with the Mono County General Plan, and in accordance with PDM GEO-4. Potential impacts would be less than significant.

Decommissioning

As discussed previously under Geothermal Resources, decommissioning of the Proposed Action would have a less-than-significant impact on Geothermal Resources.

Mitigation: None Required.

4.7.5 Alternative 2: Plant Site Alternative

4.7.5.1 Direct and Indirect Impacts

Potential impacts of Alternative 2 related to geothermal and groundwater resources would be the same as those discussed for the Proposed Action (Section 4.7.1.1).

4.7.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Impacts would be less than significant, as discussed for the Proposed Action.

4.7.6 Alternative 3: Reduced Pipeline Alternative

4.7.6.1 Direct and Indirect Impacts

Potential impacts of Alternative 3 related to geothermal and groundwater resources discussed in this section would be the same as those discussed for the Proposed Action.

4.7.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Impacts would be less than significant, as discussed for the Proposed Action.

4.7.7 Alternative 4: No Action

4.7.7.1 Direct and Indirect Impacts

Under implementation of the No Action Alternative, the CD-IV power plant, wells and pipelines would not be constructed and no impacts on geothermal resources would occur. However, installation of some additional geothermal exploration wells could still occur, in accordance with already approved permits, however, these wells would not be used for geothermal production. Well construction and decommissioning-related impacts would be the same as the Proposed Action, but reduced in intensity. However, operational impacts associated with the use of exploration wells for assessment and monitoring of geothermal resources under the No Action Alternative would have no effect on geothermal and groundwater resources.

4.7.7.2 CEQA Significance Determination

The No Project Alternative would not result in any CD-IV Project related impacts on geothermal and groundwater resources. However, previously-approved exploratory drilling that is not part of the CD-IV Project would occur and would have similar less-than-significant impacts on geothermal and groundwater resources as compared to the Proposed Action for construction and decommissioning.

4.7.8 Cumulative Impacts

4.7.8.1 Geographic Extent/Context

The geographic scope for cumulative impacts related to geothermal and groundwater resources encompasses the Long Valley KGRA and the Mammoth Groundwater Basin. Existing and proposed geothermal development projects could contribute to the cumulative impact of the Proposed Action and alternatives with respect to the Long Valley geothermal reservoir. Projects involving new water wells or public water supply wells in the Mammoth Groundwater Basin, although none have been identified, could contribute to cumulative impacts on groundwater resources. With the exception of individual water wells subject to ministerial well permits, these types of projects would undergo independent environmental review pursuant to NEPA and/or

CEQA prior to approval. Regardless, the effects of these types of projects were considered in this analysis of cumulative impacts related to geothermal and groundwater resources.

4.7.8.2 Existing Cumulative Conditions

The existing MP-1, MP-2 and PLES-1 geothermal developments at Casa Diablo area produce power from hot geothermal fluid in the Long Valley geothermal reservoir. As discussed in the sections above, geothermal developments have been operating for approximately 27 years with a total reservoir pressure decline measured at 55 psi, although the reservoir has partially recovered 10-15 psi since production was shifted to Basalt Canyon. In contrast, the pressure in the deeper Bishop Tuff increased 15 percent from initial conditions after injection in this zone began in 1991.

In the Basalt Canyon area, reservoir pressure appears to have declined about 2 percent since the increase in production from that area began in 2006, during a period in which there has been no injection of spent geothermal fluids in the Basalt Canyon area.

4.7.8.3 Reasonably Foreseeable Projects

A project to replace/update the existing MP-1 power plant, the MP-1 Replacement Project, is currently under CEQA review. This project would replace the aging MP-1 power plant with a new, more efficient binary power plant. No net change in the rate of geothermal fluid produced would result (Mono County, 2012). No public water supply projects were identified.

4.7.8.4 Construction

Cumulative impacts associated with construction of the Proposed Action or an alternative would be limited to projects under construction at the same time and within the same geothermal reservoir and groundwater basin. Construction of the MP-1 Replacement Project or demolition of the existing MP-1 plant and the CD-IV Project could overlap in time and vicinity, however, the MP-1 Replacement Project does not include the construction of any new geothermal wells. Therefore, construction related impacts of the Proposed Action on geothermal and groundwater resources would not result in a combined impact that would cause an adverse cumulative effect.

4.7.8.5 Operation and Maintenance

Operation and maintenance of the Proposed Action, Alternative 2 or Alternative 3 would occur over approximately the next 30 years. The existing and proposed Casa Diablo geothermal projects (MP-2, PLES-1, and MP-1 Replacement) are also estimated to operate over the same period and within the same geothermal reservoir. The analysis of the Proposed Action, presented above in Section 4.7.4.1, assumes the continued operation of these geothermal facilities. The numerical simulation model of the reservoir evaluates the proposed geothermal production of the CD-IV Project in combination with the continued production from the Casa Diablo facilities, thus, the analysis presented is a cumulative analysis. As concluded above, the combined impact of operation and maintenance of the CD-IV Project and the Casa Diablo geothermal developments is unlikely to cause an adverse cumulative effect with respect to geothermal and groundwater resources.

Operation and maintenance of the No Action Alternative would not involve extraction and/or reinjection from the geothermal reservoir and would not contribute to an adverse cumulative effect.

4.7.8.6 Decommissioning

The cumulative effect of decommissioning of the Proposed Action, Alternative 2 or Alternative 3, in combination with decommissioning of the other existing Casa Diablo geothermal developments, could result in a recovery of some of the pressure and temperature declines in the geothermal reservoir over time. Because little change to outflow to surface waters and geothermal manifestations is anticipated with the predicted pressure and temperature declines in the geothermal reservoir under the cumulative operation of the CD-IV Project and Casa Diablo geothermal projects, likewise, it is unlikely that a recovery or partial recovery of pressure and temperature in the geothermal reservoir over time would have a substantial effect. Decommissioning of the No Action Alternative would not contribute to a cumulative effect on geothermal resources as the wells that could be constructed under approved permits would not be used for geothermal production.

Impacts of decommissioning of the Proposed Action and Alternatives on groundwater resources (including the No Action Alternative, assuming that any approved geothermal wells constructed would need to be properly abandoned) would be primarily related to potential water quality impacts during well abandonment. These impacts would be similar to those that could occur during decommissioning of the Casa Diablo geothermal wells. Well permits and regulations would contain measures to adequately protect groundwater quality so that decommissioning of these projects would not contribute to an adverse cumulative effect.

4.7.8.7 CEQA Significance Determination

As discussed above in Section 4.7.8.5, analysis of the operation and maintenance impacts of the CD-IV Project on geothermal and groundwater resources encompasses the cumulative operation and maintenance of the CD-IV Project along with the other existing and foreseeable geothermal development projects in the Long Valley area. The cumulative impact would be less than significant. Construction and decommissioning of the CD-IV Project would have similar less-than-significant impacts on geothermal and groundwater resources. The Project’s incremental contribution in this regard would not be cumulatively considerable and the cumulative impact would be less than significant.

4.7.8.8 Mitigation Measures

No mitigation measures are required.

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4.8 Geologic, Soil and Mineral Resources

4.8.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the potential impacts from geologic, seismic and volcanic hazards to CD-IV Project facilities, facility workers and the public; as well as impacts from Project construction and operation on soil and mineral resources. Impacts are identified and evaluated based on relevant BLM and Forest Service standards, policies, and guidelines; and are also evaluated in the context of local regulations, building codes and standards.

Several issues have been identified that require analysis, and in some cases, mitigation. These issues and the approach to analysis in this EIS/EIR are as follows:

1. ***Impacts to Geologic and Soil Resources*:** This issue is generally focused on natural geologic resources including soils, minerals and other features of geologic interest such as hot springs and fumaroles.

2. ***Soil and Ground Instabilities*:** This issue addresses the potential for the Project to be subject to ground movements, either as a result of site-specific condition (i.e., expansive soils, slope instabilities, or excessive soil settlement), or regional processes such as subsidence and uplift (due to deep volcanic processes). This analysis also discusses the potential for proposed thermal fluid extraction and injection operations to result in local subsidence or settlement of the ground surface. This topic is generally focused on non-seismic geologic or soil issues that could affect the Project over the long run.

3. ***Surface Faulting and Seismic Hazards*:** This issue addresses potential effects on proposed facilities and site workers from surface fault rupture, strong seismic shaking, and/or other secondary earthquake hazards such as liquefaction or landslides. While earthquakes and related hazards would have regional consequences, this analysis is focused on increased risks to the public and/or site workers that are a direct consequence of the CD-IV Project. This would include safety risks to plant worker in the event of fault rupture, as well as a discussion of potential for well construction and thermal fluid injection to induce earthquakes.

4. ***Impacts from Regional Volcanic Hazards*:** Volcanic and seismic hazards in the region are highly related and may occur simultaneously; however, these issues are treated separated because a strong earthquake may occur without a volcanic eruption and vice versa. This issue discusses the potential for future volcanic unrest, the existing warning systems and response plans that are in effect, and possible impacts to the Project.

The overall impact conclusions for the above referenced topics are made based on the location, context, intensity and duration of impacts to natural resources (for the first issue) and public health and safety (for the last three issues). The intensity and significance of impacts with respect to natural geologic hazards consider both the probability of a particular hazard of occurring in conjunction with the level of consequences to public and/or worker health and safety that can be reasonably anticipated. For impacts to natural resources, impact intensities are determined based on the value and/or uniqueness of the resource (i.e., sensitive soils and/or prime farmland), the geographic extent of impacts (i.e., localized or widespread), and the timing of the impact (i.e., temporary or permanent).

4.8.2 Project Design Measures

The analysis assumes that the following PDMs related to geology, soils and mineral resources are fully implemented:

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

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

Geothermal Resources

4. *GEO-4*: 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 KGRA. ORNI 50, LLC also commits to operating the proposed geothermal Project in conformance with these requirements.

Natural Hazards

5. *GEO-5*: 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 IBC.

6. *GEO-6*: 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-7*: 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.

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 LRWQCB and USFS best management practices to prevent soil erosion, including the preparation of a SWPPP.

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

3. *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.

4. *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.

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

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

4.8.3 CEQA Significance Criteria

As stated in Appendix G of the CEQA Guidelines, implementation of the Project would have a significant impact on geology and soils if it were to:

a) Expose people or structures to potential substantial adverse effects, including risk of loss, injury, or death involving:

   i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

   ii. Strong seismic ground-shaking;

   iii. Seismic-related ground failure, including liquefaction; and/or

   iv. Landslides;

b) Result in substantial soil erosion or the loss of topsoil;

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property; or

e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

In addition, as stated in Appendix G of the CEQA Guidelines, implementation of the Project would have a significant impact on mineral resources if it were to:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state; or

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

4.8.4 Alternative 1: Proposed Action

4.8.4.1 Direct and Indirect Impacts

Impacts to Geologic and Soil Resources

As discussed in the affected environment, Section 3.8, there are no unique or prime farmland soils within the footprint of the CD-IV Project, nor are there mineral resources other than the existing geothermal leases that would be directly affected by the Project. No indirect impacts would occur to mineral resources or unique or prime farmland soils located outside the footprint of the Project. Geologic features in the vicinity of the Project include hot springs, fumaroles and volcanic domes. Project facilities are purposefully located away from fumaroles to avoid thermal ground conditions, and facility placement would not otherwise directly affect a unique geologic feature. The possibility for indirect effects on hot springs in the Project vicinity related to pumping of the geothermal reservoir is discussed in Section 4.7, *Geothermal Resource*. For the above reasons, this impact discussion focuses on impacts to soil resources within the Project site.

Construction

Construction activities associated with installation of proposed facilities would have a greater extent of impacts on soil resources compared to the operation and maintenance phase or the decommissioning phase of the Project. Aside from soil disturbances required for the installation of proposed facilities (i.e., drilling, excavation, grading and grubbing), additional soil disturbances would occur from vegetation clearing and soil compaction associated with equipment and material staging areas, pipeline construction corridors, and the construction of new roads and improvement or closure of existing roads. Soil compaction may increase soil erosion through decreased infiltration rates and dislodging soil particles, and can result in the loss of soil pore spaces and oxygen necessary to support native plant growth. The level of surface soil disturbances that would be required for the construction phase is summarized below (refer to Table 3.8-1 and Figure 3.8-3 for the location and name of individual soil map units to be disturbed):

1. Construction of the geothermal plant is expected to disturb approximately 283,500 sq ft (6.5 acres) of soil, primarily Vitrandic Haploxerolls-Vitrandic Xeropsamments[1].

2. Construction of the substation would require soil disturbances over approximately 0.25 acre (100 feet by 80 feet) adjacent to the power plant. A transmission line connection from the power plant substation to the existing SCE Casa Diablo Substation would be approximately 500 feet long and the alignment would be cleared of trees for an area wide enough to permit passage of trenching equipment.

3. Permanent disturbance for well facilities would be relatively small—about 0.4 acres each for up to 16 wells.

4. Construction of well facilities would each require soil disturbances over approximately 2.5 acres (needed for equipment storage and vehicles, mud pits, and containment basins).

1 This soil map unit is described in Table 3.8-1.

5. New roads, where required (see Figure 2-8), would be 15 feet wide, with a turning radius of no less than 50 feet, and would require some degree of soil compaction and surfacing to accommodate construction-related vehicles.

6. Approximately 25,000 feet of pipeline would be required from the power plant to the production/injection interconnection points. Although the pipeline would be aboveground, and a large portion of the proposed route has been previously disturbed, some soil compaction in new areas would be required to access the proposed 20-foot construction corridor along the pipeline route. The use of the catwalk construction method for pipeline installations would not require establishment of temporary roads, but would still result in a moderate degree of soil trampling and compaction. In addition, permanent soil disturbances would occur in the pipeline corridor due to installation of pipeline piers and footings but would be limited to the footprint of the pilings and footings.

Generally, construction activities would result in direct soil disturbance (i.e., through grading or excavation) at up to 20 discrete sites ranging in size from 2.5 acres (for well sites) to 6.5 acres (for the power plant), scattered over an approximately 3 mile wide area. Construction activities would also result in soil compaction within linear corridors associated with the proposed pipeline route and new roads. Due to uncertainties regarding the exact number of wells to be drilled and the timing of facility construction, the precise total acreage to undergo both temporary and long-term soil disturbance is unknown. However, based on proposed facilities and assuming all 16 wells would be drilled, the total disturbance area over the life of the CD-IV Project could be over 50 acres. However, construction of the facilities would be phased such that a much smaller area would be disturbed at any one time (for example, no more than two drill rigs would be operating at any one time). The soil types to be disturbed during construction are relatively common in the region and are not considered prime farmland soils, soils of statewide importance, nor are they otherwise considered sensitive or unique (such as hydric or serpentine soils). In addition, the Project area is currently characterized by prior soil disturbances associated with previous geothermal exploration activities, existing pipeline and well sites, as well as the presence of a fairly dense network of NFS roads and trails used primarily for public recreation. Consequently, the intensity of potential impacts is moderated by the common value of the soils and the prior disturbances associated with existing roads, trails and facilities.

Nevertheless, the topsoils present within the Project site have inherent value in that they are necessary to support the growth of vegetation native to the area. As discussed in the affected environment (Section 3.8), the USFS seeks to maintain and preserve the natural function of soils dedicated to growing vegetation, including support for plant growth function, soil hydrologic function, and a filtering - buffering function. In addition, the 1988 Inyo National Forest LRMP contains numerous standards and guidelines with respect to management of soil resources. Without measures to avoid or minimize damage to soil function (e.g., due to soil compaction and rilling) during construction and operation of the CD-IV Project, and without plans to properly decommission disturbed areas (i.e., restoration and revegetation), soils within the Project area could experience long term adverse impacts in specific areas through degradation of soil function and increased susceptibility to erosion. While soils in the Project area generally have low susceptibility to erosion, as discussed in Section 3.8, soil erosion (e.g., rilling) has been observed on slopes as gentle as 5 percent in areas where soil is bare and compacted (such as along roads).

The creation of access roads to new well pads, the well pads themselves, and staging areas as stated above could continue to result in similar types of impacts.

ORNI 50, LLC has proposed several measures to address the potential impacts on soils, including PDMs GEO-1, GEO-2, HYD-1, HYD-3, HYD-4, HYD-5, HYD-6, and HYD-7 (described in Section 3.8.1). The GEO measures are generally focused on preserving topsoils by stockpiling them until such time as they are needed for revegetation, and decompacting soils prior to topsoil replacement; and the HYD measures are focused on preventing and/or detecting and repairing erosion of soil caused by wind or water. These types of PDMs are appropriate to avoid or substantially reduce the Project's adverse impacts on soil resources. As discussed in Section 4.19, the requirements imposed by the Construction General Permit (e.g., SWPPP) and the mitigation measures identified in that discussion would also prevent or substantially reduce soil erosion by wind or water during both construction and operations. To ensure that PDMs are reviewed and approved by USFS personnel and that proper USFS standards and guidance is used when developing erosion control and drainage plans, ORNI 50, LLC shall implement **Mitigation Measure GEO-1** (See Section 4.8.9 below).

Implementation of the PDMs, water quality mitigation measures in Section 4.19, and **Mitigation Measure GEO-1**[2] would ensure that adverse impacts to soil resources are avoided or substantially reduced.

Operation and Maintenance

It is likely that, over the life of the CD-IV Project, up to six injection wells and up to eight production wells would be drilled, two wells have already been drilled for exploratory purposes. These areas were included in the Project footprint described in the setting, and the description and analysis of impacts to soils is the same as discussed for construction impacts above. Following facility and well installation, operation and maintenance activities would have minimal additional soil impacts. Access roads would require periodic maintenance, regrading, or plowing (during the winter); and some of the wells may need to be redrilled or worked over, requiring many of the same activities required to drill a new well. Additionally, production wells that do not demonstrate sufficient productivity could be converted to an injection well. All of these activities would take place within previously disturbed areas and would not require additional disturbances outside of the construction footprint analyzed for the construction phase (above). As such, the impact conclusion for the operation and maintenance phase of the Project is similar as above: without mitigation, operation and maintenance of the Project would have localized adverse impacts on soil resources in the long run.

However, implementation of the PDMs, water quality mitigation measures in Section 4.19, and **Mitigation Measure GEO-1** would ensure that adverse impacts to soil resources are avoided or substantially reduced.

Decommissioning

As part of the decommission phase, a site Abandonment-Reclamation Plan would be prepared in conformance with BLM and USFS requirements. As part of the plan, the surface of the site would be restored to conform to approximate pre-Project land uses. Decommissioning of the CD-IV

Project would have short term localized adverse impacts on soil resources while facilities are decommissioned, prior to site restoration. These impacts would be similar though less intense than construction-related impacts discussed above. During this time, similar short term measures described above would be implemented to reduce or avoid adverse impacts on soils. In the long run, areas newly disturbed by the Project would be returned to pre-construction conditions through topsoil replacement and revegetation. The PDMs ensure that reclamation activities include the appropriate restoration of soil type and quality. Areas where soils are compacted, disturbed or degraded under existing conditions would be restored and thus in these specific areas, the decommissioning phase would have a locally positive impact on soil resources in the long run.

Summary of all Phases

With implementation of identified PDMs, mitigation measures in Section 4.19, and **Mitigation Measure GEO-1**, the long-term impact of the Project as a whole (including decommissioning and the site Abandonment-Reclamation Plan) would not have any substantially adverse impacts on soil resources. There would be no impact to mineral resources (other than the geothermal reservoir) or geologic features (other than thermal springs). The possible impacts to the geothermal reservoir and thermal springs are discussed in Section 4.7, *Geothermal Resources*.

Soil and Ground Instabilities

Construction

Typical geotechnical concerns for any type of project include the potential for long-term soil and ground instabilities associated with subsidence, settlement (esp. differential settlement), expansive soils and/or landslides. These issues are normally examined and addressed in the process of obtaining permits required to construct a project, including grading and building permits. Prior to receiving building permits, ORNI 50, LLC will be required to submit to the USFS all grading plans, geologic and soils reports, and engineering designs necessary to demonstrate compliance with applicable building codes and permit provisions. Such reports must always be prepared and certified by individuals licensed in the State of California to perform their respective practice (i.e., engineering, geology, etc…).

Because a geotechnical investigation of the proposed power plant site, well pad installations, or pipeline route has not yet been conducted by ORNI 50, LLC, the potential for the proposed facilities to be adversely affected by soil and ground instabilities can only be generalized based on regional-scale topographic, geologic, and soils information presented in the affected environment section (see Section 3.8). Site-specific geologic and soil reports will be required to adequately characterize soil properties and provide appropriate recommendations for construction site preparation, fill compaction, foundation designs, and other engineering features. This information will be developed as part of grading and/or building permit application submittals, in accordance with PDM GEO-3 and GEO-5, and in compliance with Mono County building regulations (Ord. 08-02 § 1) enforced by the Mono County Building Division and standards developed by the International Code Council (ICC)[2].

[2] 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 also adopted by California in the CBC.

Based on initial examination of available geologic and soil information, the Project site is unlikely to be underlain by expansive soils, soils prone to settlement, or located within a landslide area. Soils in the Project area are relatively coarse-grained and lack significant clay fraction or thick accumulations of organic material. As such, soils are unlikely to be expansive or prone to settlement. In any case, adverse soil conditions, if present, would be a threat to Project facilities only, and not to the public at large. There are no developed properties (other than existing MPLP and SCE facilities) immediately adjacent to the proposed facilities and there is no indication that unstable soils underlying proposed facilities would affect anything other than MPLP's facilities themselves. Finally, facility damage from expansive soils or soil settlement tends to occur slowly and progressively, such that problem areas can be detected and addressed as they occur. Nevertheless, without mitigation, unstable or expansive soils could have adverse impacts on proposed facilities and worker safety.

Generally, the topics discussed above are typical geotechnical issues that are routinely addressed through application of modern building codes, compliance with permit provisions, and industry standard building practices such as removal or treatment of unsuitable soils, proper placement and compaction of imported fills, and appropriate foundation and/or retaining wall designs. However, PDM GEO-5 has an outdated reference to the IBC and seismic hazard "Zone D" and PDM GEO-6 is too vague to provide confidence that geotechnical issues will be appropriately detected, investigated and considered in Project grading plans and engineering designs. For these reasons, and to ensure proper design of the power plant, geothermal wells and ancillary facilities, **Mitigation Measure GEO-2** shall be implemented. **Mitigation Measure GEO-2** directs ORNI 50, LLC to conduct a geotechnical investigation for the proposed facilities prior to issuance of a grading permit or use permit and to retain a geotechnical engineer to be onsite during site preparation and grading to ensure geotechnical recommendations are being properly implemented. Compliance with applicable building codes, implementation of PDMs GEO-5, GEO-6 and **Mitigation Measure GEO-2** would ensure that soil and ground instabilities would not have adverse impacts on facilities and its workers.

Operation and Maintenance, and Decommissioning

A prevalent public concern regarding the deep pumping of geothermal wells is their potential to cause widespread subsidence of the ground surface. 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 (Geothermal Energy Association, 2007). The following discussion is excerpted from a publication by the Geothermal Energy Association (2007):

> 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. While subsidence can be induced by thermal contraction of the reservoir due to extraction and natural recharge, properly placed injection wells reduces the potential for subsidence by maintaining reservoir pressures. At fields produced from sedimentary rocks where the porosity and permeability is primarily between rock grains,

> injection can successfully mitigate for subsidence. At the Heber geothermal field in southern California, for example, injection successfully resolved subsidence. At The Geysers, where subsidence may be caused more by temperature decline (thermoelastic contraction) than pressure decline (poroelastic contraction), injection is not necessarily an effective mitigation tool for subsidence. However, long-term monitoring at The Geysers demonstrates a very slow rate of subsidence that has no direct environmental impact.
>
> 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. 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.
>
> In cases where subsidence may be linked to geothermal reservoir pressure decline, injection is an effective mitigating technique. By injecting spent geothermal brines back into the reservoir from which they came, reservoir pressure is stabilized. This approach has helped to maintain the pressure of geothermal reservoirs and can prevent or mitigate for subsidence at geothermal development sites.

The CD-IV Project would utilize a closed loop system of reinjecting the geothermal fluid it extracts. As discussed in the setting, natural volcanic processes have caused the region immediately northeast of the site to experience variable degrees of resurgence/uplift (an average of 80 centimeters since 1980). Neither this natural rate of uplift, the numerous small to moderate earthquakes that have occurred since construction of the existing plant, nor ongoing operation of the existing wells at the Project site have caused structural damage of the existing facility due to ground subsidence.

Nevertheless, as discussed in the affected environment, studies have established a link between geothermal fluid extraction and minor changes in land surface elevation. Documented subsidence on the order of mm/year were found, which is typical of modern developed geothermal systems and considerably less than subsidence rates in regions of extensive groundwater extraction. Notably, as with repeated inflation/deflation events of much greater magnitude in other well-studied active caldera complexes such as Yellowstone and Campi Flegri in Italy, calderas do experience complex inflation and subsidence during periods of unrest (Hill, 2006 as cited in EGS, 2012). Neither Yellowstone nor Campi Flegri or any one of many other volcanic centers experiencing complex deformation events are linked to geothermal production. The well documented unrest in Long Valley caldera has been episodic and not necessarily uniform. Recent deformation within the resurgent dome in the west central part of Long Valley caldera has been punctuated by periods of abrupt rapid uplift, relative quiescence and even minor subsidence (Hill, 2006 as cited in EGS, 2012). The leveling data are not necessarily a uniform record and early USGS baseline leveling studies around Casa Diablo document the amount of subsidence (in a "noisy" record) was less than 25 percent of the total uplift noted across the resurgent dome.

The potential for subsidence is mitigated by the differing reservoir conditions across the caldera and modern geothermal field management practices of developing the reservoirs in stages and complete return of all the produced fluid to the subsurface to avoid large-scale and irreversible effects on surface features and resource sustainability. Caldera deformation, particularly subsidence at Casa Diablo, has been discontinuous since 1988 and the record of deformation across the entire caldera including Casa Diablo has not necessarily been constant or uniform (Langbein, 2003 as cited in EGS, 2012). The USGS observed that the apparent amount of subsidence was limited and spatially related to the producing area around Casa Diablo. Interpretations related the minor amount of subsidence to a combination of thermal contraction in the deeper 700m deep injection zone and slow pressure declines in the shallow 200-meter deep production zone (Farrar and others, 1995 as cited in EGS, 2012; Langbein, 2003 as cited in EGS, 2012). Later USGS publications on the Casa Diablo field also suggest alternative mechanisms for the subsidence such as comparatively shallow effects like changes in shallow unconfined aquifers and the slow dewatering of relatively compressible, porous sediments and hydrothermally altered volcanic tuffs or tuffaceous sediments that underlie the topographic low of the structural graben that contains most of the Casa Diablo development (Howle and others, 2003 as cited in EGS, 2012). The shallow effects are part of the changes limited to the early production history of the field and are not necessarily continuous or continuing.

The planned development into Basalt Canyon will produce from a much deeper reservoir in indurated Early Rhyolite and Bishop Tuff, which should mitigate the effect of changes in shallow aquifer conditions and relatively compressible poorly consolidated altered alluvium/colluvium noted at Casa Diablo. Nevertheless, insufficient information is available to make conclusive statements about the degree to which pumping from the deeper reservoir would lessen potential subsidence rates. There is a chance that increased pumping from the deeper reservoir could continue or increase the rate of subsidence occurring naturally and occurring as a result of existing pumping operations. In order to address the uncertainty regarding expected local subsidence rates, and to protect infrastructure and resources from potentially adverse effects, **Mitigation Measure GEO-3** is proposed. This measure would expand the existing monitoring network based on the location of proposed wells, and shall establish subsidence tolerance limits to protect existing infrastructure and resources. The impact of local subsidence on infrastructure, with mitigation Measure GEO-3, would be substantially reduced or avoided altogether.

Surface Faulting and Seismic Hazards

Construction, Operation and Maintenance, and Decommissioning

Ground Shaking. As discussed above under soil and ground instability, compliance with applicable building codes, implementation of PDMs GEO-3, GEO-6 and **Mitigation Measure GEO-2** would ensure that soil and ground instabilities would not have substantial adverse impacts on facilities and its workers. This includes the effects of seismic ground shaking because building codes include requirements to design structures according to their seismic design category (CDC), which provides specific building standards based on the level and intensity of expected ground motions, and the occupancy category of the structure. Because building codes and geotechnical seismic design parameters are primarily intended to avoid building collapse or substantial structural damage, a strong earthquake could still cause short term damage to or toppling of unsecured equipment and worker injuries could still occur. However, facility impacts could be later inspected, repaired or corrected. For these reasons, with implementation of the PDMs and **Mitigation Measure GEO-2** identified above, the effects of seismic ground shaking on facilities and its workers would be minor.

Fault Rupture. The principal damage risk of surface fault rupture (exclusive of induced slip or settling) is deformation or offset along the actual location of a fault break. To avoid those potential risks, California's Alquist-Priolo act was passed in 1972 and both State and Federal geologic surveys have worked to identify faults that represent the greatest risk of near-term movement and surface rupture. The Alquist-Priolo act is intended to avoid placement of structures for human occupancy on the active traces of earthquake faults. While the Project does not propose structures for human occupancy and is thus not subject to the provisions of the Act, the information on fault traces and fault zones developed in support of the act is useful in identifying locations that may be underlain by an active fault trace. As discussed in the affected environment, Section 3.8.1.7, the following Project components are crossed by a mapped trace of the active Hilton Creek Fault, or are within its earthquake fault zone as mapped in accordance with the Alquist-Priolo act:

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. three locations along the proposed pipeline route near the existing MP-I plant, near the proposed Plant, and north of well 55-31.

Further, because proposed wells would be drilled deep into the ground, and the Hilton Creek Fault is steeply east-dipping, proposed well 55-32 may intersect the fault plane at depth. Not all of the Project components listed above, including the proposed location of the power plant and substation are actually directly located on a mapped fault trace. However, because precisely locating fault without direct observed evidence of ground rupture (which can be made following an earthquake, or by subsequent trench investigations across suspected fault traces) can be uncertain, the Alquist-Priolo act calls for the establishment of fault "zones" to account for this uncertainty and in recognition that active faults can sometimes be closely paralleled by additional faults similarly capable of rupture.

In the event of a large earthquake on the Hilton Creek Fault, offset along its trace would likely be relatively minor, as it was in 1980 when it produced several earthquakes ranging from magnitude 6 to 6.2. Nevertheless, without adequate design, fault offset (particularly if it occurred at the proposed power plant site) could have adverse consequences to overlying structures and could temporarily inhibit the plant's ability to continue normal operations. While the CD-IV Project would not construct new structures for human occupancy, it proposes facilities that are industrial in nature, containing heated water, fuels and other potential contaminants. Fault rupture beneath the proposed power plant would introduce the possibility of worker safety hazards and/or contaminant releases to the environment. Without adequate design, fault rupture beneath the CD-IV Project could cause major adverse effects to worker safety and the surrounding environment. Early development of the existing power plant included a site specific fault investigation and found that the site was not underlain by an active fault (Black Eagle Consulting Inc., 2011).

Consequently, prior to approval of final engineering designs for the proposed plant, the presence and precise location of active fault traces must be determined, and if present, design features adequate to either avoid or accommodate fault rupture must be incorporated into final designs for the plant. In accordance with PDM GEO-6, geotechnical consultants commissioned by ORNI 50, LLC are currently investigating the precise location of the Hilton Creek Fault at the Project site using a combination of detailed surveys, fault trenches, test pits and boreholes; however, results have not been released to date. As currently proposed, certain design features of the facility are likely to be adequate to accommodate ground rupture in the event of a large earthquake on the fault. For example, “expansion loops” would be constructed about every 250 to 500 feet along the production pipeline route, and further apart along the injection pipeline, so that the pipeline could “flex” as it lengthens and shortens due to heating and cooling. These design features also allow the pipeline to accommodate, without rupture, substantial offset where it crosses a fault trace. Further, 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. In the event an earthquake causes damage or rupture to wells at depth, or to the aboveground pipeline, the automatic shutdown procedure would minimize effects on the surrounding environment and would allow plant operators to inspect, detect and repair the problems without being subject to safety hazards. Additional description of emergency contingency plans, engineering and administrative controls concerning the use of hazardous materials, and health and safety mitigation measures, are further discussed in Section 4.13, *Public Safety, Hazardous Materials, and Fire*.

The probability of a large earthquake along the Hilton Creek Fault is difficult to ascertain and the potential for fault rupture to occur in the exact location of the CD-IV Project is slight. However, installation of proposed design features (expansion loops and automatic shutdown), implementation of PDM GEO-7 and **Mitigation Measure GEO-4** would reduce the implications to the worker safety, the environment, and the facility in the event a large earthquake produces fault rupture. With implementation of the mitigation measure, the impact of fault rupture on the CD-IV Project is expected to be minor.

Induced Seismicity. A prevalent public concern regarding the installation and use of deeply penetrating geothermal wells is their potential to induce seismicity. Although earthquakes typically occur naturally, seismicity has at times been induced by human activity, including the development of geothermal fields, through both production and injection operations (Geothermal Energy Association, 2007). In these cases, the resulting seismicity has been low-magnitude events known as microearthquakes. Earthquakes with Richter magnitudes below 2 or 3, which are generally not felt by humans, are called microearthquakes. These microearthquakes sometimes occur when geothermal fluids are injected back into the system, and are centered on the injection site. The microearthquakes, sometimes associated with geothermal development, are not considered to be a hazard to the geothermal power plants or the surrounding communities, and will usually go unnoticed unless sensitive seismometers are located nearby. For this reason the CD-IV Project would have no adverse impacts on buildings and other structures in surrounding communities due to induced seismicity, if it occurs.

Impacts from Regional Volcanic Hazards

Construction, Operation and Maintenance, and Decommissioning

In cooperation with the California OEM Services (OEM) and civil authorities in eastern California, the USGS has established procedures to promptly alert the public to a possible eruption. In 1982, the USGS under the Volcano Hazards Program began an intensive effort to monitor and study geologic unrest in the Long Valley Caldera. The goal of this effort is to provide residents and civil authorities in the area reliable information on the nature of the potential hazards posed by this unrest and timely warning of an impending volcanic eruption, should one develop. Most, perhaps all, volcanic eruptions are preceded and accompanied by geophysical and geochemical changes in the volcanic system. Common precursory indicators of volcanic activity include increased seismicity, ground deformation, and variations in the nature and rate of gas emissions (Battaglia et al., 2003).

Based on a geologic history of 20 eruptions over the last 5000 years and the eruption at Paoha Island approximately 250 years ago, the young silicic domes of the Mono–Inyo volcanic chain still have the potential to produce significant eruptive events. The probability of such an eruption occurring in any given year is less than 1 percent. This is comparable to the annual chance of a magnitude 8 earthquake (like the Great 1906 San Francisco Earthquake) along the San Andreas Fault in coastal California or of an eruption from one of the more active Cascade Range volcanoes in the Pacific Northwest, such as Mount Rainier.

The Project area is more than 1.8 miles (3 km) from the potential future eruption sites like the phreatic explosion craters on Mammoth Mountain and more than 3.1 miles (5 km) from potential eruptive areas around the Inyo Craters. In accordance with PDMs GEO-3, GEO-6 and **Mitigation Measure GEO-2**, Project buildings and facilities will conform to accepted construction requirements to withstand heavy snow loads which would also be able to accommodate light ash fall. Larger scale events and larger volumes of erupted materials are not projected for probable future eruptions. Should the USGS issue a volcanic watch (condition yellow) or warning (condition red) based on indicators of unrest in the region (see Section 3.8.1.8) public authorities would be notified, and the MPLP would implement emergency response procedures in accordance with PDM GEO-7. Such actions could range from generally elevated alertness and establishment of reporting and coordination protocols (under a watch), to facility shutdown and evacuation in the event of an actual eruption.

Given ORNI 50, LLC would incorporate volcanic hazards in its emergency response plan, the active monitoring by the USGS, and that the Project facilities could withstand ashfall from a volcanic eruption, the impact of volcanic activity on the CD-IV Project would be minor. The Project would have no impact on neither the likelihood of a volcanic eruption nor exposure of surrounding communities to volcanic hazards.

4.8.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.8.3.

a) Expose people or structures to potential substantial adverse effects, including risk of loss, injury, or death involving: i) rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault; ii) strong seismic ground-shaking; iii) seismic-related ground failure, including liquefaction; and/or iv) landslides.

The impacts of faulting and seismicity have been comprehensively addressed in the discussion of direct and indirect impacts in Section 4.8.4.1. Compliance with applicable building standards and implementation of PDMs GEO-3, GEO-5, GEO-6 and **Mitigation Measure GEO-2 and GEO-4** would ensure that the CD-IV Project is built to avoid or reduce potential risks to facilities, worker safety and the surrounding environment involving faulting and seismic hazards. The impact is *less than significant with mitigation*.

b) Result in substantial soil erosion or the loss of topsoil.

Impacts relating to erosion and loss of topsoil have been comprehensively addressed in the discussion of direct and indirect impacts in Section 4.8.4.1. Compliance with applicable regulations and permits (e.g., SWPPP), and implementation of PDMs GEO-1 andGEO-2 would ensure that construction, operation and maintenance and decommissioning of the CD-IV Project is performed in a manner that reduces or avoids significant impacts to topsoil and erosion. The impact is *less than significant with mitigation*.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

The impacts of soil and ground instabilities (non-seismic) have been comprehensively addressed in the discussion of direct and indirect impacts in Section 4.8.4.1. Compliance with applicable building standards, and implementation of PDMs GEO-3 and GEO-5, and implementation of **Mitigation Measure GEO-2** would ensure that the CD-IV Project is built to avoid or reduce potential risks to facilities involving on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. The impact is *less than significant with mitigation*.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property.

As discussed in the affected environment and in Section 4.8.4.1, the potential for the site to contain expansive soils is low. Nevertheless, implementation of PDMs GEO-3 and GEO-5 and **Mitigation Measure GEO-2** would avoid substantial risks to life or property involving expansive soils. The impact is *less than significant with mitigation*.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

There would be *no impact* with respect to this topic because there are no septic tanks proposed as part of the CD-IV Project.

4.8.5 Alternative 2: Plant Site Alternative

4.8.5.1 Direct and Indirect Impacts

Impacts to Geologic and Soil Resources

Alternative 2 would affect a slightly different area and extent of soil, because the proposed location of the power plant and the eastern end of the pipeline alignment would change. However, the soil units affected would likewise not be prime farmland soils or otherwise sensitive or unique soils. Alternative 2 would not require the proposed pipelines to branch at Old Highway 395 because the alternative plant site would be reached along the same path to the eastern-most well pads, thereby reducing the total length of the pipeline required. However, because a longer electrical transmission line would be required relative to the Proposed Action (because of the increased distance between the alternative plant site and the existing substation), the reduction in the length of the pipeline is approximately cancelled out by the increase in the length of transmission line required. Because the total area of disturbance would not substantially change, the impacts of Alternative 2 on geologic and soil resources would be the same or similar to those discussed for the Proposed Action (Section 4.8.4.1). Therefore the impact conclusion is the same. Implementation of identified PDMs and mitigation measures would avoid or substantially reduce the potential adverse impacts on soil resources at the Project site.

Soil and Ground Instabilities

Alternative 2 would affect a slightly different area and extent of soil, because the proposed location of the power plant and the eastern end of the pipeline alignment would change. However, the soil units affected would remain the same. Therefore the impacts of Alternative 2 on soil and ground instabilities would be the same as those discussed for the Proposed Action (Section 4.8.4.1). Compliance with applicable building codes, implementation of PDMs GEO-3, GEO-6 and **Mitigation Measure GEO-2** would ensure that soil and ground instabilities would not adversely affect proposed facilities and its workers.

Surface Faulting and Seismic Hazards

Ground Shaking. While the layout of proposed facilities would change slightly under Alternative 2, the Project would remain located in the same general location and would be underlain by the same geologic units and soil types. As such, the maximum level of ground shaking that can be reasonably anticipated are the same as discussed for the Proposed Action (Section 4.8.4.1). Like the Proposed Action, compliance with applicable building codes, implementation of PDMs GEO-3, GEO-5, and GEO-6 and **Mitigation Measure GEO-2** would ensure that the effects of seismic ground shaking would remain minor.

Fault Rupture. While the layout of proposed facilities would change slightly under Alternative 2, the Project would remain located in the same general location and would likewise be underlain active fault traces of the Hilton Creek Fault. The alternative plant site would be located near another trace of the Hilton Creek Fault, located further to the east. Similar to the proposed action, the alternative plant site would be located in the mapped fault zone, but not the mapped trace of the fault. For these reasons, impacts from fault rupture and proposed mitigation would be the same as discussed for the Proposed Action (Section 4.8.4.1). With installation of proposed design features (expansion loops and automatic shutdown), implementation of PDMs GEO-6 and GEO-7, and **Mitigation Measure GEO-4**, the Project would ensure that fault rupture would not adversely affect proposed facilities and its workers.

Induced Seismicity. Alternative 2 would not change the wellfield or levels of anticipated geothermal pumping; and thus impacts from induced seismicity would be the same as the Proposed Action. Alternative 2 would have no adverse impacts on buildings and other structures in surrounding communities due to induced seismicity, if it occurs.

Impacts from Regional Volcanic Hazards

While the layout of proposed facilities would change slightly under Alternative 2, the Project would remain located in the same general location and would likewise be subject to the same volcanic hazards. Given ORNI 50, LLC would incorporate volcanic hazards in it emergency response plan (PDM GEO-8), the active monitoring by the USGS, and that the Project facilities could withstand ashfall from a volcanic eruption, the impact of volcanic activity on the CD-IV Project would remain minor.

4.8.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 2 would remain less than significant.

4.8.6 Alternative 3: Modified Pipeline Alternative

4.8.6.1 Direct and Indirect Impacts

Impacts to Geologic and Soil Resources

Under Alternative 3, the location of the power plant and the number and location of proposed wells would not change from that of the Proposed Action. Only the proposed routes for the production and injection pipelines, as well as the number and location of new access roads would change. The ultimate length (and area of disturbance) associated with construction and operation of the pipelines would not be substantially reduced or lengthened; however, from a soil disturbance perspective, Alternative 3 presents a slightly preferable option due to the collocation of proposed facilities with proposed access roads, as well as the increased length of double pipelines, which mean impacts are less dispersed and more concentrated. As such, the type and level of impacts on soil resources under alternative 3 would be the similar but slightly reduced compared to impacts of the Proposed Action (Section 4.8.4.1).

Soil and Ground Instabilities

Under Alternative 3, the location of the power plant and the number and location of proposed wells would not change. Only the proposed routes for the production and injection pipelines would change. However the route change in relation to soil and ground instabilities is inconsequential. Therefore, the impacts of Alternative 3 on soil and ground instabilities would be the same as those discussed for the Proposed Action (Section 4.8.4.1).

Surface Faulting and Seismic Hazards

Under Alternative 3, the location of the power plant and the number and location of proposed wells would not change. Only the proposed routes for the production and injection pipelines would change. However the route change does not result in a greater or lesser number of active fault crossings, nor does it change the level of seismic hazard expected at the site. Therefore, the impacts of Alternative 3 on surface faulting and seismic hazards would be the same as those discussed for the Proposed Action (Section 4.8.4.1).

Impacts from Regional Volcanic Hazards

While the layout of proposed facilities would change slightly under Alternative 3, the Project would remain located in the same general location and would likewise be subject to volcanic hazards. Given ORNI 50, LLC would incorporate volcanic hazards in its emergency response plan (PDM GEO-7), the active monitoring by the USGS, and that the Project facilities could withstand ashfall from a volcanic eruption, the impact of volcanic activity on the CD-IV Project would remain minor.

4.8.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 3 would remain less than significant.

4.8.7 Alternative 4: No Action

4.8.7.1 Direct and Indirect Impacts

Under the No Action Alternative, the CD-IV power plant, wells and pipelines would not be constructed and no related impacts on geologic, soils, and mineral resources would occur. The Project area would continue to experience the same existing levels of geologic, seismic and volcanic hazards. Soil resources within undisturbed areas associated with Project pipelines and power plant would not be adversely affected and areas that are currently devoid of vegetation or compacted for access roads would continue to exist in that condition. However, installation of some additional geothermal exploration wells could still occur, in accordance with already approved permits. Impacts resulting from previously-approved well construction and decommissioning would be similar to those described Proposed Action, but to a lesser degree. Operational impacts associated with the use of exploration wells for assessment and monitoring of geothermal resources under the No Action Alternative would have no effects on geologic, soils, and mineral resources.

4.8.7.2 CEQA Significance Determination

Under CEQA, the No Action Alternative would result in no impacts from power plant or pipeline construction because the change from existing conditions would be minimal to none. Impacts resulting from well construction would be similar to those described under the Proposed Action but to a lesser degree, as five fewer wells could be constructed.

4.8.8 Cumulative Impacts

4.8.8.1 Geographic Extent/Context

The geographic extent considered for potential cumulative impacts to people and structures related to geologic and seismic hazards is more localized or site-specific. The temporal scope includes construction, operation and maintenance of the Project. For soil resources, the geographic extent for cumulative impacts is the general area surrounding the site with similar soil types. As analyzed above, the Project alone would not result in substantial adverse impacts on soil and geologic resources, soil and ground instabilities, faulting and seismic hazards, or volcanic hazards, given required compliance with building codes, the PDMs, and implementation of **Mitigation Measures GEO-2 and GEO-4**.

4.8.8.2 Existing Cumulative Conditions

Existing cumulative conditions with respect to geology, soils and seismicity are as described in the description of the affected environment, Section 3.8.

4.8.8.3 Reasonably Foreseeable Projects

Soil and ground instabilities, faulting and seismic hazards, or volcanic hazards all relate to local, site-specific soil conditions, ground response to earthquakes, and are impacts that are limited to the footprint of the CD-IV Project. The presence or construction of other projects does not increase the probability or severity of seismic hazards to which the Project site might be exposed. As such, the impacts with respect to these issues are not cumulative in nature. Even other projects that are overlapping with the CD-IV Project would be held to the same seismic and building standards as the CD-IV Project. Other cumulative projects that are overlapping with the pipeline route or geothermal wells are recreational type projects or road/highway improvements (e.g., Digital 395 Middle Mile Project, Sawmill Cutoff Road Reconstruction Project, Inyo National Forest Shady Rest Motorized Staging Project, Trails System Master Plan, Parks and Recreation Master Plan Update) that would not subject MPLP facilities or its workers to increased risk of geologic hazards.

However, other large development projects could result in extensive soil disturbances. Such projects include:

1. Mammoth View Project
2. Old Mammoth Place
3. Search and Rescue Facility
4. Mammoth Creek crossing
5. Hidden Creek Crossing
6. Snowcreek Master Plan
7. Sierra Star Master Plan Project

To the extent that these project would disturb natural soils (as opposed to previously developed/impacted areas), they would result in similar types of impacts as described for the CD-IV Project to soil resources.

4.8.8.4 Cumulative Impact Analysis

As discussed in the impact analysis (Section 4.8.3.1), the soils in the Project area are not considered prime farmland soils, soils of statewide importance, nor are they otherwise considered sensitive or unique (such as hydric or serpentine soils). In addition, the Project area is currently characterized by prior soil disturbances associated with geothermal development, a fairly dense network of forest roads and trails used for public recreation, and the developed area of Mammoth Lakes. The large development projects that are reasonably foreseeable would similarly be subject to the Construction General Permit (e.g., SWPPP), as described above and in Section 4.19, *Surface Water Hydrology*, reducing adverse impacts of soil loss during construction and on water quality within downstream receiving waters. Specific provisions, discharge limitations, and BMPs required of development projects under the construction general permit are developed with the aim of addressing basin-wide erosion and water quality problems; therefore, the water quality standards that must be met under the permit are defined to address cumulative water quality conditions within the watershed (and are strict as a result). The adverse effects of construction activities on soil loss and erosion, even if development projects were overlapping in the construction phase with the CD-IV Project, would be minor in the cumulative context.

However, if all the projects were permitted and proceeded to construction, large areas of soil could be permanently excavated, compacted, or otherwise disturbed to accommodate utility lines, roads, and building foundations. The contribution of the CD-IV Project to the total soil resources to be disturbed under the cumulative scenario would be minimal, especially given decommissioning of the Project would restore the land to its preconstruction condition. However, as a whole, the cumulative impact with respect to permanent soil disturbance due to development would be moderate. While the area of impact could be rather large and permanent (if all projects proceeded to construction), the affected soils are already somewhat impacted under existing cumulative conditions, and they would not consist of prime farmland soils, soils of statewide importance, nor would they be otherwise sensitive or unique.

4.8.8.5 CEQA Significance Determinations

With respect to soil and ground instabilities, faulting and seismic hazards, and volcanic hazards, no significant cumulative impact would result from the cumulative scenario to which the Project's incremental impact could contribute, for the reasons described above.

4.8.9 Mitigation Measures

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, or 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 subsidence monitoring program conducted by the USGS will be reviewed by the USGS and LVHAC members to ensure adequate subsidence monitoring is conducted for the CD-IV Project. Based on recommendations by the USGS and LVHAC members, the subsidence monitoring program would 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. If additional subsidence monitoring is deemed necessary, the Project applicant would develop a monitoring plan. The monitoring plan would include subsidence and uplift tolerances for potential impacts to infrastructure and resources, and shall prescribe particular actions (e.g., require discontinued or reduced pumping rates) in the event tolerances are exceeded. Additional monitoring may include installation of new or updated monitoring equipment 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 CD-IV 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**.**

4.8.10 Residual Impacts after Mitigation Incorporated

Following implementation of mitigation measures provided in Section 4.8.9, all adverse impacts on geology, soils and seismicity resulting from construction, operations and maintenance, and decommissioning of the CD-IV Project and Alternatives would be avoid or substantially reduced.

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4.9 Grazing, Wild Horses and Burros

4.9.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts to permitted livestock grazing, wild horses and burros. Primary sources of information for this analysis included:

1. USFS issued livestock grazing permits for the area.
2. 2010 Geocommunicator (BLM)
3. 2006 BLM map for HAs and HMAs

4.9.1.1 Wild Horses and Burros

According to the 2010 Geocommunicator on the BLM website and the 2006 BLM map for HAs and HMA, California (south), there are no HAs, or HMAs located within or adjacent to the CD-IV Project or Alternatives. The Proposed Action or Alternatives would have no impact on wild horses, or burros and therefore are not analyzed further.

4.9.1.2 Livestock Grazing

In order to assess the potential for the Proposed Action or Alternatives to affect permitted livestock grazing in the Project area, this analysis evaluates whether livestock forage would be reduced and whether Project components would impede or prevent livestock from accessing different foraging areas.

4.9.2 Project Design Measures

No PDMs pertaining to livestock grazing have been identified.

4.9.3 CEQA Significance Criteria

The following significance criteria potentially pertaining to livestock grazing activities were identified (criteria c and d would not apply) from the CEQA Guidelines Appendix G. A project would cause adverse impacts on agriculture if it would:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

e) Involve other changes in the existing environment which due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

4.9.4 Alternative 1: Proposed Action

The analysis of direct and indirect impact for the Proposed Action is organized according to the following Project phases: construction; operation and maintenance; and decommissioning.

4.9.4.1 Direct and Indirect Impacts

Within the Hot Creek Allotment, the Proposed Action would result in direct impacts on grazing leases by permanently decreasing the amount of available grazing habitat by 6.5 acres from construction of the power plant, an additional 0.25 acre from construction of the substation, and 0.75 acre from construction of the transmission line. In the Sherwin/Deadman Allotment, the CD-IV Project would result in the loss of 1.4 acre of grazing lands through construction of new access roads.

The CD-IV Project would also result in direct impacts on livestock during construction and decommissioning activities by temporarily reducing the amount or quality of available forage, as 27.5 acres of habitat would be temporarily affected and unavailable during construction of the 9.2-miles of pipeline. If the construction period coincides with the grazing period, livestock could wander into construction areas; construction noise and traffic could make them more difficult to manage, resulting in “spooked” or lost livestock; and livestock could be injured or killed. Construction is anticipated to occur over a 3-month period as construction activities move in succession along the pipeline route. The annual permitted grazing season is from July 5 to September 30, although the Sherwin/Deadman permittee spends only a portion of that time in the Project area as sheep are rotated throughout the allotment. It is likely that the time of construction and the time of grazing could be coordinated to avoid conflict. Grubbing or vegetation clearing activities would be limited to drilling areas, road under-crossings, and cable trenching but large-scale ground disturbance is not proposed during construction of the above-ground pipeline. This analysis assumes a 40-foot-wide corridor along the length of the pipeline would be temporarily affected by construction activities, with natural reclamation beginning immediately after construction and forage restored within a growing season. Based on that assumption, approximately 27.5 acres of lower-quality Jeffrey/Sagebrush/Bitterbrush forage would be temporarily affected within the Hot Creek and Sherwin/Deadman Allotments. It should be noted that the section of the Hot Creek Allotment that is within the Project area is rarely used by cattle. This temporary reduction in forage is a negligible percentage of the total suitable acreage within the allotments, which are reported to be 8,731 acres and 12,418 acres, respectively (BLM, 2005). The completed above-ground pipeline is not anticipated to reduce or eliminate grazing habitat because vegetation can re-establish beneath it and shadowing would not be substantial enough to prevent regrowth. Impacts from decommissioning would be similar to construction impacts except that no temporary loss of vegetation is anticipated during decommissioning.

Development of the well field with up to 16 total wells would result in the temporary removal of 2.5 acres of vegetation at each well site (up to 40 acres total) during construction. Following construction, vegetation would be restored on 2.1 acres at each site. Approximately 0.4 acres at each well would be fenced and remain devoid of vegetation for the life of the well. In summary, there would be 6.4 acres of vegetation removed long-term and 33.6 acres of short term disturbance.

Operation and maintenance activities include the potential to re-drill, work-over, or stimulate additional wells over the life of the CD-IV Project. These activities would be consistent with approved exploration activities and stipulations, which anticipate a total of 15 potential well sites. Ground disturbance associated with these well sites is negligible. The Proposed Action also has the potential to create or expand areas of thermal ground, which could adversely impact the quality or quantity of forage available. However, this is unlikely and is not anticipated to be an outcome of the CD-IV Project.

The above-ground pipeline would allow for approximately 12 to 18 inches of ground clearance beneath, but could present a barrier to livestock movement and/or management. Parallel pipelines, if spaced far enough apart could result in livestock becoming trapped between pipes. Road under-crossings would occur approximately every quarter-mile to provide sufficient crossing and escape opportunities (see Figure 4.4-2), however there would be some pipeline segments that do not offer quarter-mile undercrossings. Compliance with the mitigation measures described below in Section 4.9.9 would compensate for the permanent reduction in grazing area resulting from construction of new access roads, well fields, and the Casa Diablo power plant, and would avoid and minimize permanent impacts on grazing livestock resulting from Project operation and maintenance.

4.9.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.9.2.

The Project area does not contain Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, and is not zoned for agricultural use. The Farmland Mapping and Monitoring Program (FMMP) designates the Project site as “Not Mapped”. The Project area is also not under Williamson Act Contract, and therefore would not result in impacts based on the CEQA criteria.

4.9.5 Alternative 2: Plant Site Alternative

4.9.5.1 Direct and Indirect Impacts

Impacts would be similar under Alternative 2. Although the plant would be constructed at an alternative location, it is still located within the Hot Creek Allotment. Alternative 2 would result in a permanent loss of 7.3 acres of grazing land from construction of the plant, 0.25 acres from construction of the substation, and 5.61 acres from the construction of the transmission line. Alternative 2 would also result in the permanent loss of 1.4 acre of grazing land from construction of new access roads, the permanent loss of up to 6.4 acres of grazing land from construction of the well field, and the temporary loss of up to 33.6 acres of grazing land from construction of the well field. Total pipeline mileage would be 9.3 miles (26.9 acres of temporary disturbance) versus 9.2 miles under the Proposed Action (27.5 acres of temporary disturbance).

4.9.5.2 CEQA Significance Determination

CEQA significance determination would be the same as described above for the Proposed Action. As described above under 4.9.4.2 CEQA Significance Determination, Alternative 2 would not result in impacts based on the CEQA criteria.

4.9.6 Alternative 3: Modified Pipeline Alternative

4.9.6.1 Direct and Indirect Impacts

Total impacts would be similar under Alternative 3, although the pipeline would be modified east of U.S. Highway 395. The total pipeline length would be 9.1 miles (26.3 acres of temporary disturbance) versus 9.2 miles under the Proposed Action (27.5 acres of temporary disturbance). Like the Proposed Action, Alternative 3 would result in permanent losses of 6.5 acres of grazing land from construction of the plant, 0.25 acres from construction of the substation, and 0.75 acres from the construction of the transmission line. Alternative 2 would also result in the permanent loss of 1.4 acres of grazing land from construction of new access roads, up to 6.4 acres of grazing land from construction of the well field, and the temporary loss of up to 33.6 acres of grazing land from construction of the well field.

4.9.6.2 CEQA Significance Determination

CEQA significance determination would be the same as described above for the Proposed Action. As described above under 4.9.4.2 CEQA Significance Determination, Alternative 3 would not result in impacts based on the CEQA criteria.

4.9.7 Alternative 4: No Action

4.9.7.1 Direct and Indirect Impacts

Under Alternative 4, no plant, above-ground pipeline, or new access roads would be constructed. No impacts to grazing allotments would occur from the construction of a power plant and pipelines, and grazing allotments would not be subject to a temporary loss of 61.1 acres of grazing land or a permanent loss of 15.3 acres of grazing land.

However, not part of the CD-IV Project, up to 11 exploration wells could be constructed, which were approved previously and analyzed in previous NEPA and CEQA documents. For comparison purposes, construction footprint and methods would be similar to under the Proposed Action resulting in the clearing of approximately 2.5 acres of vegetation during construction of each well. The long-term disturbance area would be less than the 0.4 acres similar to that described under the Proposed Action, but an exact acreage would depend on whether the well would be used for monitoring, testing, or other uses.

4.9.7.2 CEQA Significance Determination

CEQA significance determination would be the same as described above for the Proposed Action.

Alternative 4 would not result in impacts because no construction would occur.

4.9.8 Cumulative Impacts

4.9.8.1 Geographic Extent/Context

The Sherwin/Deadman Grazing Allotment occurs west of U.S. Highway 395, encompasses the Project area, and contains 12,418 acres of suitable grazing habitat. The Hot Creek Grazing Allotment occurs east of U.S. Highway 395, encompasses the Project area, and contains 8,731 acres of suitable grazing habitat.

4.9.8.2 Existing Cumulative Conditions

The Project vicinity can be characterized as a remote, rugged area with little development. The proposed CD-IV Project would not make a considerable contribution to cumulative effects on grazing allotments in the vicinity. As a whole, the CD-IV Project would temporarily impact 61.1 acres and permanently impact 15.3 acres. Within the Sherwin/Deadman Grazing Allotment, temporary and permanent impacts would occur to suitable grazing land, affecting less than 0.001 percent of the total in each case. Within the Hot Creek Grazing Allotment, temporary and permanent impacts would occur to suitable grazing land, also affecting less than 0.001 percent of the total in each case.

4.9.8.3 Reasonably Foreseeable Projects

Several projects overlap the Project area, including a power plant replacement on 7.5 acres and construction of a new 583-mile fiber network adjacent to U.S. Highway 395. In the Project vicinity, a new airport terminal and parking spaces will be constructed at Mammoth Airport Terminal. Other projects are small-scale endeavors in developed areas, including street improvements, city park improvements, bicycle and pedestrian trails, rest-area improvements, and similar projects. None of these projects are likely to impact grazing leases in a significant way, because they are either small in scale, located within developed areas, or replacing existing structures.

4.9.9 Mitigation Measures

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.

4.9.10 Residual Impacts after Mitigation Incorporated

No significant impacts to grazing leases would occur if the permittee complies with Mitigation Measures GRZ Measures 1 and 2. Residual impacts before mitigation is incorporated include the permanent loss of 6.5 acres of grazing habitat resulting from plant construction and 1.4 acre of grazing habitat resulting from construction of new access roads. However, if the USFS seeks reimbursement from the geothermal lessee for loss of grazing habitat, it is assumed that the reimbursement will adequately compensate for permanent losses and no residual impact would occur. Residual impacts before mitigation is incorporated also include the potential for above-ground pipelines to restrict livestock movement and/or frustrate their management. If the USFS Authorized Officer does not make recommendations for additional under-crossings, or if the recommendations are inadequate, or if the geothermal lessee is not able to incorporate the recommendations into Project design, there could be residual impacts related to livestock movement and management.

4.10 Land Use

4.10.1 Methodology for Analysis

The analysis of land use impacts for the CD-IV Project and Alternatives addresses issues of consistency with adopted land use or habitat conservation plans and policies and the potential creation of new physical barriers within the existing Mammoth Lakes and Mono County communities. The analysis related to a physical disruption of an existing community is based on an assessment of the existing land uses, characteristics in the surrounding area, and the extent to which the CD-IV Project would introduce new land uses or alter existing land uses. Impacts to recreation-related land uses are addressed in Section 4.14, *Recreation.*

4.10.1.1 Consistency with Land Use Plans, Policies and Regulations

Evaluation of potential land use impacts of the CD-IV Project and Alternatives is based on review of the plans, policies and guidelines that would apply to the Project identified in Section 3.10, including BLM and USFS standards, policies, and guidelines, as well as local plans for Mono County and the Town of Mammoth Lakes.

Impact assessment is based on known impacts relative to construction, operation and maintenance, and decommissioning of the proposed pipeline and power plant. Potential land use conflicts are identified and evaluated based on existing land uses, land uses proposed as part of the CD-IV Project and Alternatives, BLM land use-related standards and policies, federal land use designations established in the LRMP (USFS, 1988), a consistency analysis of the CD-IV Project with existing land use and zoning as defined by the Mono County General Plan and Zoning Ordinance (Mono County, 2010a and 2010b), respectively, and a consistency analysis with the Town of Mammoth Lakes General Plan and Zoning Map (Mammoth Lakes, 2007 and 2010). Land use compatibility is based on the intensity and patterns of land use to determine whether the CD-IV Project would result in incompatible uses or nuisances.

4.10.2 Project Design Measures

The analysis assumes that the following PDMs related to land use are fully implemented:

1. *LU-1*: 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).

2. *LU-2*: Prior to operation of the Project, Ormat will prepare a Site Abandonment-Reclamation Plan in conformance with BLM and USFS requirements. When Project operations are complete, Ormat will restore the site to approximate pre-Project land uses according to the plan requirements.

4.10.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to land use and planning if it would:

a) Physically divide an established community;

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect; or

c) Conflict with any applicable habitat conservation plan or natural community conservation plan.

Regarding criterion c), the CD-IV Project would not be located within the boundaries of an existing habitat conservation plan (HCP) or natural community conservation plan (NCCP); therefore, this criterion is not discussed in this section.

4.10.4 Alternative 1: Proposed Action

4.10.4.1 Direct and Indirect Impacts

Consistency with Land Use Plans, Policies, and Regulations

The following provides consistency determinations for land use plans, policies, and regulations that would be applicable to the CD-IV Project during construction, operation and maintenance, and decommissioning.

Geothermal Steam Act

Under the terms of the Geothermal Steam Act of 1970, the BLM is the federal agency delegated for management of geothermal operations on federal lands leased for geothermal resource development. Discussion of this act as it pertains to the Proposed Action is included in Section 1.6.1, Federal Policy Consistency and Land Use Plan Conformance.

BLM Bishop Field Office Resource Management Plan

The Proposed Action is consistent with the BLM Bishop Field Office RMP which directs management to provide for geothermal exploration and development.

USFS, Inyo National Forest LRMP

The Proposed Action would be consistent with the LRMP as it would not conflict with the management directions regarding applicable resource areas, such as geology, recreation, riparian areas, visual resources, and wildlife. As discussed in Section 4.18, *Visual Resources*, there are mapped VQOs in the CD-IV Project area. In addition, portions of leases CACA-14407 and CACA-14408 are designated as “No Surface Occupancy” areas to protect critical visual zones along U.S. Highway 395, SR 203, and Sawmill Cutoff Road (NFSR 03S08). Implementation of

PDMs VIS-1 through VIS-4, and LU-1, would generally reduce the visibility of pipelines in scenic areas. Implementation of **Mitigation Measures VIS-1: Landscape Plan**, **VIS-2: Underground Pipeline Crossovers**, and **VIS-4: Power Plant Landscape Plan** (see Section 4.18.9 below) would further reduce the visual effects of the CD-IV Project. However, even with implementation of these measures the CD-IV Project would remain inconsistent in some areas with VQOs designated as "retention."

Mono County General Plan

The CD-IV Project 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*). This designation is intended to "recognize and maintain a wide variety of values in the lands outside existing communities…including geothermal or mineral resources." The *RM-INF* designation recognizes the planning authority of the USFS over the publically owned land, and that the land is subject to the LRMP. USFS concurrence with BLM's approval of the CD-IV Project and any Conditions of Approval required by the USFS, as described above, would ensure consistency with the LRMP.

The only portion of the CD-IV Project and Alternatives that would be on private land would be proposed pipelines going across land leased by ORNI 50, LLC or owned by LADWP. Private land in the Project area is designated as *Resource Management* (*RM)* [ORNI 50, LLC]. Activities proposed on the private lands are subject to the approval of a use permit by Mono County through the Mono County Economic Development Department and the Mono County Planning Commission. Neither the power plant site nor any wells are proposed on private lands. Approvals by the County for the CD-IV Project would include the following (MPLP, 2010):

1. Use Permit (from Economic Development)
2. Building permits (from the Building Division)
3. Grading Permit (from Public Works)

Mono County General Plan policies which would be applicable to portions of the CD-IV Project located on private lands are listed in Section 3.10. Relevant policies from the Land Use Element describe enhancing and maintaining the environmental and economic integrity of the County; avoidance of incompatible land uses; minimization of visual and cultural resources impacts; and maintaining recreational areas. The CD-IV Project would contribute to economic growth in the County and reduce environmental impacts through implementation of mitigation measures and PDMs included in Section 4.6, *Cultural and Paleontological Resources*; Section 4.14, *Recreation*; and Section 4.18, *Visual Resources*.

The Conservation/Open Space Element includes specific policies regarding geothermal development. Relevant policies describe the need to protect hydrologic resources and water quality; minimization or prevention of adverse effects on deer population and migration; adherence to air quality standards and regulations; and minimization of noise associated with geothermal development. Implementation of mitigation measures and PDMs listed in Section 4.2, *Air Resources*; Section 4.3, *Biological Resources-Wildlife*; Section 4.7, *Geothermal Resources*; and Section 4.11, *Noise and Vibration* would ensure consistency of the Project with the Mono County General Plan.

In addition, as stated in Section 3.10, the Mono County General Plan planning and land use maps supersede county zoning maps.

Town of Mammoth Lakes General Plan

A portion of the well pipeline constructed under the CD-IV Project and Alternatives would be located within the Mammoth Lakes Municipal Boundary, on land designated as *National Forest (NF)*. National Forest Land is not subject to the land use jurisdiction of the Town of Mammoth Lakes. As such, the CD-IV Project would be consistent with the Town of Mammoth Lakes General Plan.

4.10.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (construction, operation and maintenance, decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.10.3.

a) Physically divide an established community.

Construction

The CD-IV Project is located in a relatively rural and forested area in unincorporated Mono County on National Forest System land administered by the USFS as part of the Inyo National Forest. The nearest established community to the proposed power plant site is the Town of Mammoth Lakes. The Municipal Boundary of Mammoth Lakes is approximately 2 miles west of the proposed power plant. The Project could change access to the Project area through the construction of the Project (power plant, pipelines, and above-ground transmission line) and would result in temporary and permanent road closures and the construction of new roads for various Project components.

The power plant would be constructed on land that is currently vacant forest land within Inyo National Forest. Construction of the power plant would require the permanent closure of a portion of one road, NFSR 03S129E. The road would dead end at the CD-IV power plant fence and reopen on the other side. This portion beyond the plant would continue to be accessible by Antelope Springs Road (03S05) or Substation Road. If entrance to the power plant is provided through the substation, the portion NFSR 03S129E between the power plant and substation would also be permanently closed.

Construction of the pipelines would also result in temporary closures and restrictions on other NFSRs (see Table 2-3 and Figure 2-8). The proposed main well pipeline and injection pipeline would be located mostly parallel to or along the same corridor as the existing pipeline in Basalt Canyon. The pipeline would be constructed near ground level (averaging 12 to 18 inches above the ground surface); however, to allow continued public access on roads that the pipeline must cross, the pipeline would be constructed to cross under existing roads. The proposed pipeline would also be constructed underground at the same location as the existing pipeline where it crosses U.S. Highway 395.

Pipeline crossings of NFSRs would be constructed by the cut-and-fill method whereby a trench up to ten feet deep would be cut through the road. 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 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) is blocked at a time, and public access would not be prevented.

In addition to construction of the power plant and pipelines, an above-ground transmission line up to 1,000 feet long and supported by 3 to 6 poles would connect the power plant with the existing SCE Casa Diablo Substation. Construction of the transmission line may temporarily restrict access on roads located between the power plant and the SCE substation.

With the exception of permanent closure of a small portion of NFSR 03S129E and small sections or rerouted road, construction impacts would be temporary. Even with permanent closure of a portion of NFSR 03S129E, construction of the CD-IV Project would not result in the division of an established community. The impact would be less than significant.

Operation and Maintenance

A segment of NFSR 03S129E would be closed adjacent to the proposed power plant as a result of the Proposed Action. NFSR 03S129E would dead end at the power plant fence and reopen on the other side, which would be accessible by Antelope Springs Road (03S05) or Substation Road. Alternate routes would provide access to areas of Inyo National Forest typically accessed by this segment of NFSR 03S129E. The construction of some wells would require some existing NFSRs to be permanently modified; however, the relocation would be minor and would not impact access to the area. Pipelines would cross under existing roads and therefore not impact access past construction. Similarly, operation of the above-ground transmission line would not restrict movement on existing roads in the long-term. Overall, modifications to the existing road network would not result in the division of an established community so the impact would be less than significant.

Decommissioning

Decommissioning activities would cause temporary USFS road closures similar to those described above under Construction. These closures would be temporary and would not result in the division of an established community; the impact would be less than significant.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

As discussed above in Section 4.10.4, the CD-IV Project would not conflict with any land use plan, policy, or regulation applicable to the CD-IV Project, including the BLM Geothermal Steam Act, BLM Bishop Field Office RMP, LRMP, Mono County General Plan, Mono County Zoning Ordinance, and Town of Mammoth Lakes General Plan. Furthermore, the CD-IV Project would not result in substantial changes in the pattern, scale, or character of use in the Project area. The area is already developed with geothermal energy, so the CD-IV Project would not conflict with current land uses and would not interfere with the existing geothermal uses. Therefore, the CD-IV Project would not conflict with an applicable land use plan, policy, or regulation and the impact would be less than significant.

4.10.5 Alternative 2: Plant Site Alternative

4.10.5.1 Direct and Indirect Impacts

Consistency with Land Use Plans, Policies, and Regulations

The same land use plans, policies, and regulations applicable to the Project would be applicable to Alternative 2. Like the CD-IV Project, Alternative 2 would be consistent with the BLM Geothermal Steam Act, LRMP, Mono County Zoning Ordinance, and Town of Mammoth Lakes General Plan. A portion of the above-ground transmission line would cross private land in Mono County. Construction of the above-ground line on the private land would be inconsistent with the Land Development Regulations found in the Land Use Element of the Mono County General Plan. Specifically, Section 11.010 (D) requires that utility lines be installed underground.

4.10.5.2 CEQA Significance Determination

Construction, operation and maintenance activities associated with Alternative 2 would be similar to or the same as the CD-IV Project. Although this Alternative would not require closure of NFSR 03S129E, construction and operation of the power plant would result in the closure of the western portion of NFSR 28E207. The eastern portion of NFSR 03S130 would be rerouted around the power plant to maintain through access. The above-ground transmission line connecting the power plant with the existing SCE Casa Diablo Substation would be substantially longer than proposed under the CD-IV Project. However, there are few roads in the path of the proposed transmission line route; therefore, temporary construction restrictions on roads would be similar to the CD-IV Project. Construction of the above-ground transmission line on private land in Mono County would be consistent with the General Plan upon approval of a variance by the County to construct such a line. Alternative 2 would not physically divide any established communities and would be consistent with local land use plans, policies and regulations. Consequently, CEQA significance determinations would be the same as described above for the CD-IV Project: less than significant.

4.10.6 Alternative 3: Modified Pipeline Alternative

4.10.6.1 Direct and Indirect Impacts

Consistency with Land Use Plans, Policies, and Regulations

The same land use plans, policies, and regulations applicable to the CD-IV Project would be applicable to Alternative 3. Like the CD-IV Project, Alternative 3 would be consistent with the

BLM Geothermal Steam Act, LRMP, Mono County General Plan, Mono County Zoning Ordinance, and Town of Mammoth Lakes General Plan.

4.10.6.2 CEQA Significance Determination

Construction, operation and maintenance activities associated with Alternative 3 would be similar to or the same as the CD-IV Project. Alternative 3 would not physically divide any established communities and would be consistent with local land use plans, policies and regulations. Consequently, CEQA significance determinations would be the same as described above for the CD-IV Project: less than significant.

4.10.7 Alternative 4: No Action

4.10.7.1 Direct and Indirect Impacts

The No Action Alternative would result in no impacts to land use at the Project site because the proposed power plant and pipeline would not be constructed and the existing uses would not change.

4.10.7.2 CEQA Significance Determination

Compared to the CD-IV Project, this Alternative would result in reduced impacts as no roads would be blocked or temporarily closed; they would remain available for use. Implementation of this Alternative would result in no impact.

4.10.8 Cumulative Impacts

4.10.8.1 Geographic Extent/Context

The geographic scope of the cumulative effects analysis for land use includes the northeastern portion of the Mammoth Lakes region of Inyo National Forest, the Town of Mammoth Lakes, and portions of Mono County in the vicinity of the CD-IV Project. This geographic scope was established based on the boundaries of the land use planning entities with jurisdiction over the CD-IV Project.

4.10.8.2 Existing Cumulative Conditions

Existing conditions within the cumulative impacts area reflect a combination of the natural condition and the effects of past actions and are described in Chapter 3. Direct and indirect effects of the construction, operation and maintenance, and closure and decommissioning of the CD-IV Project are analyzed above. The Project area consists of relatively rural and forested land, administered primarily by the USFS as part of the Inyo National Forest in unincorporated Mono County. Existing geothermal power plants, pipelines, and ancillary facilities are located in the Project area (collectively referred to as the Casa Diablo Geothermal Complex).

4.10.8.3 Reasonably Foreseeable Projects

A wide variety of past, present, and reasonably foreseeable future development projects could contribute to the cumulative conditions regarding land use in the cumulative analysis area. Table 4.1-1, in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the Project site and surrounding area that were used to develop this analysis of cumulative effects. Among this list, applications for geothermal projects that could be developed in the vicinity of the CD-IV Project include the MP-I Replacement Project, which could be developed approximately 0.25 mile southeast of the proposed power plant. This Project would continue to utilize the existing geothermal resource in Basalt Canyon and use the existing pipeline that connects to the current MP-I power plant. The Digital 395 Project would also occur in the Project area. The proposed cable would be installed in Sawmill Cutoff Road (NFSR 03S08). Construction activities would need to be coordinated if the CD-IV Project and Digital 395 were to take place at the same time.

4.10.8.4 Construction, Operation and Maintenance, and Decommissioning

Cumulative impacts related to land use could occur during the projected 30-year lifespan of the CD-IV Project if future projects were constrained by the placement of Project-related facilities. The CD-IV Project would not constrain lands for reasonably foreseeable projects that would make them infeasible or that would result in adverse impacts to land use. Therefore, it could not contribute to cumulative effects related to these land use and planning issues.

4.10.8.5 CEQA Significance Determinations

The CD-IV Project would have less than significant impacts with respect to the physical division of an established community, conflict with an applicable land use plan or policy, or conflict with a habitat conservation plan or natural community conservation plan. The CD-IV Project would not contribute to cumulative impacts regarding land use.

4.10.9 Mitigation Measures

No mitigation measures are required to reduce impacts related to land use planning.

4.10.10 Residual Impacts after Mitigation Incorporated

Because no mitigation measures are recommended, impacts to land use would be the same as discussed in Section 4.10.4, *Alternative 1: Proposed Project*.

4.11 Noise and Vibration

This section describes the conditions related to noise that would occur during construction, operation, maintenance, and decommissioning of the CD-IV Project and Alternatives. The methods for analysis and the CEQA significance criteria are followed by direct and indirect impact discussions and CEQA significance conclusions for the CD-IV Project and Alternatives. Cumulative impacts and mitigation measures to reduce any cumulative impacts also are identified.

4.11.1 Methodology for Analysis

This analysis evaluates potential noise impacts of the CD-IV Project and Alternatives based on review of nearby noise receptors, ambient noise levels, and projected noise levels that would be associated with construction, operation, maintenance, and decommissioning of the CD-IV Project and alternatives. Impact discussions are based, in part, on measured representative noise levels as presented in the noise report prepared by the ORNI 50, LLC (Ormat, 2011). The following methods were used to evaluate impacts.

4.11.1.1 Short-term Construction and Decommissioning Noise Impacts

Modeled short-term construction noise levels were estimated for the main components of the proposed CD-IV Project, including well site clearing, well drilling, pipeline construction, and power plant construction. CD-IV Project-related construction noise is compared to Mono County and Town of Mammoth Lakes construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime, respectively. In addition, the Federal Transit Administration (FTA) has identified daytime and nighttime 8-hour L_{eq} levels of 80 dBA and 70 dBA, respectively, as noise levels where adverse community reaction to short-term construction noise could occur (FTA, 2006). Therefore, noise levels at nearby receptor locations that would be associated with short-term construction and decommissioning activities are also compared to the daytime and nighttime 8-hour L_{eq} levels.

4.11.1.2 Long-term Operation and Maintenance Noise Impacts

Long-term operation and maintenance noise levels were estimated for the proposed well pumps and the power plant. The USEPA-recommended residential noise guideline is an L_{dn} of 55 dBA. This level is not a regulatory goal but is “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (USEPA, 1974). Long-term CD-IV Project-related operation and maintenance noise is also compared to the Mono County and Town of Mammoth Lakes exterior noise standards for rural suburban residences of 40 dBA L_{eq} during nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.) and 50 dBA L_{eq} during daytime hours (i.e., 7:00 a.m. to 10:00 p.m.) at a residential property. This analysis also identifies whether L_{dn} noise level increases associated with long-term operation and maintenance activities would exceed 3 dBA at sensitive receptor locations.

Vibration Impacts

A PPV threshold identified by Caltrans is used in this analysis to determine the level of vibration impacts related to adverse human reaction and risk of architectural damage to normal buildings.[1] The PPV threshold is 0.20 inches per second (in/sec) (Caltrans, 2004). This PPV level has been found to be annoying to people in buildings and can pose a risk of architectural damage to buildings.

4.11.2 Project Design Measures

The analysis assumes that the following PDMs related to noise are fully implemented:

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, Ormat will submit, and secure the approval of the USFS, a program designed to adequately respond to noise complaints. As part of the program, Ormat 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 Ormat will make reasonable efforts to investigate and respond to any such complaint or inquiry within 24 hours of the complaint or inquiry. Ormat 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.

4.11.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse noise impacts if it would result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b) Exposure of persons to or generation of, excessive ground borne vibration or ground borne noise levels;

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the Project;

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

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1 Architectural damage could be structural damage, such as cracking of floor slabs, foundations, columns, beams, or wells, or cosmetic architectural damage, such as cracked plaster, stucco, or tile (Caltrans, 2004).

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the Project area to excessive noise levels; or

f) For a project within the vicinity of a private airstrip, exposure of people residing or working in the Project area to excessive noise levels.

The thresholds for determining the CEQA significance of impacts in this analysis are based on the environmental checklist in Appendix G of the CEQA Guidelines, on guidance provided by the Mono County General Plan and County Code and the Town of Mammoth Lakes Municipal Code, and on a comparison of estimated CD-IV Project-related noise levels relative to ambient conditions. For the purposes of this analysis, the CEQA significance thresholds used to assess criteria a) through d) are the same as those identified in the methods used to evaluate impacts described in Section 4.11.1.

4.11.4 Alternative 1: Proposed Action

4.11.4.1 Direct and Indirect Impacts

Construction Noise

Construction of the proposed power plant is expected to be completed over a period of approximately 16 months. Construction of the power plant would be concurrent with construction of the proposed well pads and pipeline installations. The well pads would require approximately 12 months to complete, but would be phased during two summer seasons. Construction of the pipelines would require approximately six months (one summer season). Below are descriptions of the anticipated construction noise levels that would occur associated with power plant construction activities, well drilling and pipeline construction, and off-site worker and truck delivery trips.

Power Plant Construction

Construction of the proposed CD-IV power plant would occur over a period of approximately 16 months and would involve the short-term use of heavy equipment such as backhoes, cranes, loaders, dozers, graders, excavators, compressors, and generators. Based on the types of construction equipment that would be required to construct the power plant and typical noise levels from representative pieces of construction equipment as identified by the FTA (FTA, 2006), it is anticipated that power plant construction activities would result in average noise levels of up to 85 dBA at 50 feet (see Table 4.11-1 below).

Using the excess ground attenuation rate (i.e., 7.5 dBA per doubling of distance) for absorptive ground surfaces, the distances of the closest receptors to the CD-IV power plant site, and the construction equipment representative noise level, noise levels that would be associated with power plant construction at the nearest noise receptor locations have been estimated and are presented in Table 4.11-2. As described in the table, the noise level from power plant construction would be 30 dBA or less at the nearby noise receptor locations, which would not likely be audible.

TABLE 4.11-1
TYPICAL MAXIMUM NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, L_{eq} at 50 feet)
Backhoe	80
Flatbed Truck	88
Air Compressor	81
Dozer	85
Air Compressor	85
Grader	85
Front End Loader	85
Water Trucks	88
Cranes	83
Concrete Trucks	88

SOURCE: FTA, 2006.

TABLE 4.11-2
ESTIMATED CD-IV POWER PLANT CONSTRUCTION NOISE LEVELS AT NEARBY NOISE RECEPTORS

Noise Receptor	Distance from Closest Source	Power Plant Construction L_{eq} (dBA)
Residence at Chance Ranch	1.5 miles	30
Sherwin Creek Campground	1.6 miles	29
John Muir Wilderness Area	2.5 miles	25

NOTES: Estimated noise levels are based on representative noise levels obtained from FTA, 2006. It should be noted that the noise levels identified in the table are considered to be conservative because they do not account for the forest surrounding the CD-IV power plant site, which would provide additional sound attenuation that would decrease the estimated noise levels at the noise receptor locations.

Because CD-IV power plant construction activities would not occur within 500 feet of residential or commercial occupancies, the proposed activities would not be subject to Mono County workday hour limits. In addition, daytime and nighttime construction noise levels would not exceed the county construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime, respectively. Also, short-term power plant construction noise would result in noise levels at the nearest receptor locations that would be substantially less than the FTA's daytime threshold for community annoyance of 80 dBA.

Well Drilling and Pipeline Construction

On-site well drilling and pipeline construction activities would introduce temporary noise sources to the CD-IV Project area that would result in noise levels above the ambient noise levels in the immediate vicinity of the well sites and pipeline routes. The principal noise sources would be heavy-duty construction equipment, such as excavators, loaders, graders, backhoes, etc., that would be required to clear the well sites and construct the pipeline, and the drill rig and associated support equipment. Well site clearing and pipeline construction activities would be conducted during daylight hours; however, well drilling activities would occur 24 hours per day, 7 days a week for approximately two months at each well site. Pipeline construction activities would proceed in a linear fashion and would not be expected to occur at any one location for longer than a combined total of 5 days, with the exception of the U.S. Highway 395 crossing, which would likely require up to several weeks to complete.

Noise level exposures would fluctuate, depending on the construction activity, equipment type, and distance between noise sources and receptors. Based on the types of construction equipment that would be required for well site clearing and pipeline construction activities and typical noise levels from representative pieces of construction equipment as identified by the FTA (FTA, 2006), it is anticipated that well site clearing and pipeline construction activities would result in average noise levels of up to 85 dBA at 50 feet (see Table 4.11-1). To estimate drill rig noise levels at nearby receptor locations, this analysis uses measured drill rig noise levels as representative drill rig noise level that would be associated with the CD-IV Project. ORNI 50, LLC measured drilling noise at a geothermal well in rural Mineral County, Nevada on October 21, 2010 (Appendix E). The drill site was near the bottom of a flat, wide valley, with high desert brush; the weather was cloudy with little to no wind, and there were no background noise sources noted other than the drilling rig (Ormat, 2011). Noise measurements were collected at seven locations, ranging from approximately 50 feet to 0.5 mile from the drill rig. The average noise level calculated from the seven measurements was approximately 61 dBA at 400 feet from the drill rig (Ormat, 2011).

Using the excess ground attenuation rate (i.e., 7.5 dBA per doubling of distance) for absorptive ground surfaces (see Section 3.11.1.1), the distances of the noise receptors to the closest well sites, and the representative noise levels discussed above, noise levels that would be associated with well site clearing and drilling at the nearest noise receptor locations have been estimated and are presented in Table 4.11-3. Because the closest parts of the proposed pipelines to the noise receptor locations coincide with the approximate locations of the well sites, the estimated well site clearing and pipeline construction noise levels are expected to be equivalent.

TABLE 4.11-3
ESTIMATED CD-IV WELL SITE CLEARING, PIPELINE CONSTRUCTION, AND DRILLING NOISE LEVELS AT NEARBY NOISE RECEPTORS

Noise Receptor	Distance from Closest Well Site (Well #)	Clearing and Pipeline Construction L_{eq} (dBA)	Drilling L_{eq} (dBA)
Mammoth Elementary School	4,800 feet (38-25)	36	34
Residences along Trails End Road	4,200 feet (38-25)	37	35
Shady Rest Park	160 feet (38-25)	72	71
Shady Rest Campground	2,600 feet (38-25)	42	41
Sherwin Creek Campground	4,800 feet (55-61)	36	34

NOTES: Estimated noise levels are based on representative noise levels obtained from Ormat, 2011, and FTA, 2006. It should be noted that the noise levels identified in the table are considered to be conservative because they do not account for the forest surrounding the CD-IV Project well sites, which would provide additional sound attenuation that would decrease the estimated noise levels at the noise receptor locations.

As described in Table 4.11-3, well site clearing and pipeline construction activities would result in slightly higher noise levels compared to drilling activities. However, well site clearing and pipeline construction would occur only during daylight hours, whereas the well drilling activities would occur continuously for approximately two months at each of the well sites. It is possible that well drilling may occur in close proximity to pipeline construction. In those instances, the average noise levels experienced at local sensitive receptors would be approximately 2 to 3 dBA higher than the site clearing and pipeline construction noise levels identified in Table 4.11-3.

The average estimated ambient daytime and nighttime noise levels at noise receptors in the area range between 40 dBA and 50 dBA, and between 30 dBA and 40 dBA, respectively. These noise levels equal an L_{dn} range of 40 dBA to 50 dBA. Noise levels from daytime construction activities at Well Site 38-25 would easily be audible at Shady Rest Park. However, the noise levels would not be expected to be intrusive, considering the typically noisy nature of activities supported by the park. Daytime construction activities may also be audible at the Shady Rest Campgrounds, but at much lower levels. Given the estimated low ambient noise levels at the receptor locations, nighttime well drilling activities may be audible at each of the receptors identified in Table 4.11-3. It should also be noted that the noise levels in Table 4.11-3 would occur only for the closest well site and for a duration of two months for each well site; construction activities and drilling at more distant well sites would result in lower noise levels at those sensitive receptors.

Because proposed pipeline and well site construction activities would not occur within 500 feet of residential or commercial occupancies, the proposed activities would not be subject to Mono County workday hour limits. In addition, daytime and nighttime construction noise levels would not exceed the Mono County and Town of Mammoth Lakes construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime, respectively. Also, short-term noise would result in noise levels at the nearest sensitive receptor locations that would be substantially less than the FTA's daytime and nighttime adverse community reaction thresholds of 80 dBA and 70 dBA L_{eq}, respectively.

Off-Site Vehicle Travel

In addition to on-site construction equipment noise levels, off-site traffic associated with CD-IV Project construction activities would contribute to overall environmental noise levels. As described in Section 4.16, *Traffic, Transportation, and Circulation*, construction-related traffic would be expected to result in a total of up to 554 daily trips. Based on the estimated amount of traffic that would be generated by the CD-IV Project, and if 100 percent of CD-IV Project-related construction traffic would travel on those roads, which is unlikely, the estimated daily vehicle trips associated with concurrent construction activities would represent an 7 and 12 percent increase in daily traffic volumes on SR 203 and U.S. Highway 395, respectively. This increase in traffic volumes would be expected to increase average ambient noise levels along SR 203 and U.S. Highway 395 by less than 1 dBA L_{dn}, which would not be a perceivable increase in noise.

Construction Vibration

Temporary sources of groundborne vibration and noise during construction would result from operation of conventional heavy construction equipment such as graders, bulldozers, and loaded haul trucks. These pieces of equipment can generate vibration levels of up to 0.09 in/sec at a distance of 25 feet (Caltrans, 2004). However, vibration levels attenuate rapidly from the source. At a distance of 160 feet, which is the approximate distance between the closest receptor and any of the CD-IV Project components involving active heavy construction equipment, vibration would not be perceivable. Groundborne noise is the rumbling sound of structure surfaces caused by high vibration levels. Because CD-IV Project construction would not result in exposure of persons to or generation of excessive groundborne vibration, it also would not expose them to or generate excessive groundborne noise levels.

Operation and Maintenance Noise

Below are descriptions of the estimated long-term operation and maintenance noise levels that would be associated with the CD-IV Project.

Power Plant

The principal noise sources that would be associated with the CD-IV power plant would be turbine operations and the fans in the air condensers. For a representative power plant noise level, ORNI 50, LLC measured existing noise levels at various distances from the Galena-3 geothermal power plant located near Reno, Nevada (Ormat, 2011). The Galena-3 plant is relatively new with similar technology and equipment as proposed for the CD-IV power plant. Average measured and calculated noise levels at Galena-3 were 71.5 dBA at 150 feet, 64.5 dBA at 400 feet, 54 dBA at 0.25 mile (1,320 feet), and 48 dBA at 0.50 mile (2,640 feet) from the center of the plant. These levels can be considered representative of the proposed CD-IV power plant. Using the excess ground attenuation rate (i.e., 7.5 dBA per doubling of distance) for absorptive ground surfaces, the distances of the closest noise receptors to the CD-IV power plant site, and the representative noise level at 0.50 mile, L_{eq} and L_{dn} noise levels that would be associated with the proposed power plant at the nearest noise receptor locations have been estimated and are presented in Table 4.11-4.

TABLE 4.11-4
ESTIMATED CD-IV POWER PLANT NOISE LEVELS AT NEARBY NOISE RECEPTORS

Noise Receptor	Distance from Power Plant Site	Power Plant L_{eq} (dBA)	Power Plant L_{dn} (dBA)
Residence at Chance Ranch	1.5 miles	36	42
Sherwin Creek Campground	1.6 miles	35	41
John Muir Wilderness Area	2.5 miles	31	37

NOTES: Estimated noise levels are based on representative noise levels obtained from Ormat, 2011. It should be noted that the noise levels identified in the table are considered to be conservative because they do not account for the forest surrounding the CD-IV Project power plant site, which would provide additional sound attenuation that would decrease the estimated noise levels at the noise receptor locations.

Noise levels identified in Table 4.11-4 would be below ambient conditions during daytime and would be similar to ambient conditions during nighttime. Power plant noise would not be expected to be audible at the noise receptor locations. The noise levels at the Chance Ranch residence and at the campgrounds would be below the county applicable nighttime residential exterior noise limit (i.e., 40 dBA L_{eq}), as well as the USEPA-recommended residential noise guideline (55 dBA L_{dn}). In addition, the proposed CD-IV power plant would generate a noise level of up to 48 dBA at 0.5 mile; therefore, the CD-IV Project would comply with BLM GRO Order No. 4, which requires geothermal operations not to exceed a noise level of 65 dBA, as the power plant is located over 0.5 mile from the lease boundaries (0.65 mile at the closest location).

Well Pumps

The CD-IV Project would include production and injection wells. The injection wells would not have pumps and would therefore be silent. Production wells would have electric-powered pumps that would generate a steady hum in the immediate area around the well. For a representative pump noise level, ORNI 50, LLC took noise measurements of existing Well 57-25. The existing well is surrounded by slatted chain link fences. The representative noise level was collected outside of the fence and was measured to be 58 dBA at 100 feet from the well pump (Ormat, 2011).

Using the excess ground attenuation rate (i.e., 7.5 dBA per doubling of distance) for absorptive ground surfaces, the distances of the closest receptors to the CD-IV well sites, and the representative noise level discussed above, L_{eq} and L_{dn} noise levels that would be associated with well pumps at the nearest receptor locations have been estimated and are presented in Table 4.11-5. The L_{dn} noise levels are estimated only for the nighttime sensitive receptor locations. As described in the table, the L_{dn} noise level from the well pumps would be less than 30 dBA at the nearby receptor locations, which would not likely be audible.

TABLE 4.11-5
ESTIMATED CD- IV WELL PUMP NOISE LEVELS AT NEARBY NOISE RECEPTORS

Noise Receptor	Distance from Closest Well Site (Well #)	Well Pump L_{eq} (dBA)	Well Pump L_{dn} (dBA)
Mammoth Elementary School	4,800 feet (38-25)	16	NA
Residences along Trails End Road	4,200 feet (38-25)	17	23
Shady Rest Park	160 feet (38-25)	53	NA
Shady Rest Campground	2,600 feet (38-25)	23	29
Sherwin Creek Campground	4,800 feet (55-61)	16	22

NOTES: Estimated noise levels are based on representative noise levels obtained from Ormat, 2011. It should be noted that the noise levels identified in the table are considered to be conservative because they do not account for the forest surrounding the CD-IV Project well sites, which would provide additional sound attenuation that would decrease the estimated noise levels at the noise receptor locations.

NA: Not Applicable (not a nighttime sensitive receptor location).

Noise levels from the well pump at Well Site 38-25 would likely be audible at the baseball fields at Shady Rest Park. Although well pump noise would not be expected to be disruptive, considering the typically noisy nature of activities conducted at the park, the USFS has recommended implementation of mitigation under NEPA to ensure that there would be no adverse effects related to disturbance of Shady Rest Park users (see Mitigation Measure NO-1). Noise levels at other receptors identified in Table 4.11-5 are anticipated to be below ambient conditions and would not be expected to be audible.

In addition, the noise levels at the residences along Trails End Road and at the campgrounds would be well below the county and town applicable nighttime residential exterior noise limit (i.e., 40 dBA L_{eq}), as well as the USEPA-recommended residential noise guideline (55 dBA L_{dn}). It should also be noted that the noise levels in Table 4.11-5 would occur only for the closest well site; well pumps at more distant well sites would result in lower noise levels at those sensitive receptors.

Well pumps would require regular maintenance and/or replacement every two to five years. When necessary, well pumps would be removed and re-installed in the well bore in the same manner as the initial installation. The resulting noise levels would be approximately the same as well site construction activities for the one to two days required to change out the pump. It may be necessary to re-drill, work-over, or stimulate the wells, and/or drill one or more replacement wells over the life of the CD-IV Project. The noise levels associated with these infrequent maintenance activities would be expected to be no greater than identified above for well drilling activities.

Other Operational Noise Sources

Operations of the CD-IV Project would require approximately six new employees that would be required to perform operations and maintenance activities of the new facilities. As a result, once the facilities are fully operational, approximately six new vehicle trips would be generated (up to 12 one-way trips); however, this marginal increase in vehicle trips would not result in a long-term increase in ambient noise levels.

In addition, typical pipeline operations would produce almost no noise, only a very slight rumble as the geothermal fluid moves down the pipeline and an occasional "creak" noise as the pipe would flex. However, with the insulation around the pipes, there would be no audible noise immediately adjacent to the pipeline.

Operation and Maintenance Vibration

Operation and maintenance of the CD-IV Project would not introduce any new sources of perceivable groundborne vibration to the study area. Consequently, the CD-IV Project would cause no operation- or maintenance-related effects associated with groundborne vibration. Because implementation of the CD-IV Project would not result in exposure of persons to or generation of excessive groundborne vibration, it also would not expose them to or generate excessive groundborne noise levels. Consequently, there would be no groundborne noise-related adverse effects associated with operation and maintenance of the CD-IV Project.

Decommissioning

At the end of the 30-year term of the CD-IV Project, operation would cease and associated facilities would be decommissioned and dismantled, and the site would be restored in conformance with BLM and USFS requirements. Decommissioning activities could generate temporary noise levels similar to those that would occur during construction of the CD-IV Project (see Tables 4.11-2 and 4.11-3, above). Project-related decommissioning activities would not occur within 500 feet of a residence or commercial facility; therefore, the proposed activities would not be subject to Mono County workday hour limits. In addition, decommissioning noise levels would not exceed the Town of Mammoth Lakes construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime hours, respectively. Also, decommissioning noise would result in noise levels at the nearest receptor locations that would be substantially less than the FTA's daytime and nighttime thresholds for adverse community reaction of 80 dBA and 70 dBA L_{eq}, respectively.

4.11.4.2 CEQA Significance Determination

Significance determinations for the impacts identified for the CD-IV Project are provided below based on the CEQA Significance Criteria presented in Section 4.11.3.

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Construction and Decommissioning

CD-IV Project construction and decommissioning activities would be exempt from the time of day work restrictions in the Mono County Code because the construction activities would not occur within 500 feet of a residence or commercial facility. The closest component of the CD-IV Project to any inhabited dwelling would be Well Site 38-25, at a distance of approximately 0.8 mile. In addition, as shown in Tables 4.11-2 and 4.11-3, construction and decommissioning noise levels would not exceed the Mono County or Town of Mammoth Lakes construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime hours, respectively. Therefore, the short-term construction- and decommissioning-related impacts would be less than significant.

Operation and Maintenance

As described in Section 4.11.4.1, long-term operation and maintenance noise (i.e., noise from the well pumps and power plant) would not exceed either Mono County or Town of Mammoth Lakes noise standards, including the daytime (50 dBA L_{eq}) and nighttime (40 dBA L_{eq}) exterior standards for one and two family residences. The maximum noise exposure at a residence would be as high as 35 dBA L_{eq} as a result of the proposed power plant operations (see Table 4.11-4). This noise exposure level would be less than Mono County's nighttime exterior standard, and would therefore be less than significant.

b) Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels.

Construction, Operation, Maintenance, and Decommissioning

Temporary and long-term sources of groundborne vibration and noise that would be associated with the CD-IV Project would not be perceivable at the nearest receptor locations (see Section 4.11.4.1, above). Therefore, the CD-IV Project would cause no vibration or groundborne noise impacts.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the Project.

Construction and Decommissioning

Construction and decommissioning of the CD-IV Project would not result in permanent noise sources. No impact would occur

Operation and Maintenance

The CD-IV Project would result in semi-permanent (i.e., approximately 30 years) noise sources due to operation and maintenance of the proposed well pumps and power plant. However, maximum noise exposure due to the CD-IV Project at the nearest residence would be no higher than 42 dBA L_{dn} as a result of power plant operation noise (see Section 4.11.4.1, above). This noise exposure would not be expected to exceed the existing ambient noise level at the nearest residence due to the elevated ambient noise levels in the vicinity of U.S. Highway 395. Therefore, the related impact would be less than significant.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Construction and Decommissioning

Construction and decommissioning of the CD-IV Project would result in temporary noise levels at the nearest receptor locations (see Tables 4.11-2 and 4.11-3). Noise levels from daytime construction activities at Well Site 38-25 would be readily audible at the baseball fields at Shady Rest Park. However, the noise levels would not be expected to be disruptive, considering the typically noisy nature of activities conducted at the park. Given the estimated low ambient noise levels at the receptor locations, nighttime well drilling activities at the closest well site may be audible at each of the receptors identified in Table 4.11-3; however, the noise levels do not represent a substantial increase in ambient noise levels. CD-IV Project short-term construction and decommissioning noise levels at the nearest receptors would be considerably less than the FTA’s daytime and nighttime community annoyance thresholds of 80 dBA and 70 dBA L_{eq}, respectively. Thus, any CD-IV Project-related temporary increase in ambient noise levels due to construction or decommissioning would not be substantial, and associated impacts would be less than significant.

Operation and Maintenance

Temporary or periodic noise levels associated with operation of the power plant would be limited primarily to breaker noise at the proposed substation, which would be very short duration sound events, expected to occur only a few times throughout the year. However, breaker noise would not be expected to be audible at the nearest noise receptor locations, which are approximately 1.6 miles from the proposed substation site. In addition, the CD-IV Project would require periodic maintenance. These maintenance-related activities would not be audible at the nearest sensitive receptor locations, which are located approximately 1.6 miles from the site. Therefore, operation and maintenance of the CD-IV Project would not result in temporary or periodic increases in ambient noise levels at the nearest receptor locations. No impact would occur.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the Project area to excessive noise levels.

The proposed CD-IV power plant site would be located approximately 3 miles northwest of the Mammoth Yosemite Airport. The closest component of the CD-IV Project to the Mammoth Yosemite Airport would be Well Site 65-32, which would be approximately 2.5 miles to the northwest. Therefore, the CD-IV Project would not expose CD-IV Project workers to excessive airport noise levels. In addition, the CD-IV Project would not involve the development of noise-sensitive land uses that would be exposed to excessive aircraft noise. No impact would occur.

f) For a project within the vicinity of a private airstrip, exposure of people residing or working in the Project area to excessive noise levels.

Construction, Operation and Maintenance, and Decommissioning

No components of the CD-IV Project would be within the vicinity of a private airstrip. Because the CD-IV Project would not be within the immediate vicinity of an airstrip, there would be no impact.

4.11.5 Alternative 2: Plant Site Alternative

4.11.5.1 Direct and Indirect Impacts

Construction

Construction of the Alternative 2 power plant would involve the short-term use of the same heavy equipment that would be required to construct the CD-IV power plant (i.e., backhoes, cranes, loaders, dozers, graders, excavators, compressors, and generators). Based on the types of construction equipment that would be required to construct the Alternative 2 power plant and typical noise levels from representative pieces of construction equipment as identified by the FTA (FTA, 2006), it is anticipated that alternative power plant construction activities would result in average noise levels of up to 85 dBA at 50 feet. The residence at Chance Ranch would be approximately 0.5 mile from the Alternative 2 power plant site, and the Sherwin Creek

Campground and John Muir Wilderness Area would be approximately 2.0 miles from the Alternative 2 power plant.

Using the excess ground attenuation rate (i.e., 7.5 dBA per doubling of distance) for absorptive ground surfaces, the distances of the closest receptors to the Alternative 2 power plant site, and the construction equipment representative noise level, noise levels that would be associated with Alterative 2 power plant construction at the nearest noise receptor locations have been estimated and are presented in Table 4.11-6. As described in the table, the noise level from power plant construction would be up to 42 dBA at the closest noise receptor location, which would be approximately 12 dBA higher than the CD-IV power plant, but would still not likely be audible.

TABLE 4.11-6
ESTIMATED ALTERNATIVE 2 POWER PLANT CONSTRUCTION NOISE LEVELS AT NEARBY NOISE RECEPTORS

Noise Receptor	Distance from Closest Source	Power Plant Construction L_{eq} (dBA)
Residence at Chance Ranch	0.5 mile	42
Sherwin Creek Campground	2.0 miles	27
John Muir Wilderness Area	2.0 miles	27

NOTES: Estimated noise levels are based on representative noise levels obtained from FTA, 2006.

Because the Alternative 2 power plant construction activities would not occur within 500 feet of residential or commercial occupancies, the activities would not be subject to Mono County workday hour limits. Also, short-term power plant construction noise would result in noise levels at the nearest receptor locations that would be substantially less than the Mono County construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime, respectively. Also, short-term power plant construction noise would result in noise levels at the nearest receptor locations that would be substantially less than the FTA's daytime threshold for community annoyance of 80 dBA.

Compared to the Proposed Action, Alternative 2 would result in a slightly greater short-term construction impact relative to the Proposed Action because the alternative power plant site would be closer to the residence at Chance Ranch, and construction noise levels at the residence would be higher than under the Proposed Action.

Operation

The base noise levels that would be associated with the Alternative 2 power plant would be the same as those that would be associated with the CD-IV power plant. Therefore, the representative noise levels measured by ORNI 50, LLC associated with the Galena-3 power plant were also used to evaluate noise levels at nearby receptors that would be associated with the Alternative 2 power plant (Ormat, 2011). Using the excess ground attenuation rate (i.e., 7.5 dBA per doubling of distance) for absorptive ground surfaces, the distances of the closest noise receptors to the Alternative 2 power plant site, and the representative noise level at 0.50 mile (i.e., 48 dBA), L_{eq}

and L_{dn} noise levels that would be associated with the Alternative 2 power plant at the nearest noise receptor locations have been estimated and are presented in Table 4.11-7.

TABLE 4.11-7
ESTIMATED ALTERNATIVE 2 POWER PLANT NOISE LEVELS AT NEARBY NOISE RECEPTORS

Noise Receptor	Distance from Power Plant Site	Power Plant L_{eq} (dBA)	Power Plant L_{dn} (dBA)
Residence at Chance Ranch	0.5 mile	48	54
Sherwin Creek Campground	2.0 miles	33	39
John Muir Wilderness Area	2.0 miles	33	39

NOTES: Estimated noise levels are based on representative noise levels obtained from Ormat, 2011.

Noise levels identified in Table 4.11-7 for the closest receptor (the residence at Chance Ranch) would be below ambient conditions during daytime and would be similar to ambient conditions during nighttime. Alternative 2 power plant noise may be audible during nighttime hours when traffic levels along U.S. Highway 395 are relatively low; however, power plant noise would not be expected to be audible at the residence during daytime hours. The noise levels at the Chance Ranch residence would exceed the Mono County applicable nighttime residential exterior noise limit (i.e., 40 dBA L_{eq}), but would be within the USEPA-recommended residential noise guideline of 55 dBA L_{dn}. The Alternative 2 power plant would generate a noise level of up to 48 dBA at 0.5 mile; therefore, Alternative 2 would comply with BLM GRO Order No. 4, which requires geothermal operations not to exceed a noise level of 65 dBA.

Compared to the Proposed Action, Alternative 2 would result in a greater longer-term operation and maintenance impact relative to the Proposed Action because the alternative power plant site would be closer to the residence at Chance Ranch, and operation noise levels at the residence would be higher than under the Proposed Action.

Decommissioning

At the end of the 30-year term of Alternative 2, operation would cease and associated facilities would be decommissioned and dismantled, and the site would be restored in conformance with BLM and USFS requirements. Decommissioning activities could generate temporary noise levels similar to those that would occur during construction of the Alternative 2 power plant (see Table 4.11-6, above). Alternative 2-related decommissioning activities would not occur within 500 feet of a residence or commercial facility; therefore, the activities would not be subject to Mono County workday hour limits. Also, short-term power plant decommissioning noise would result in noise levels at the nearest receptor locations that would be substantially less than the Mono County construction equipment residential noise limits that are as low as 60 dBA and 50 dBA for stationary equipment during daytime and nighttime, respectively. In addition, decommissioning noise would result in noise levels at the nearest receptor locations that would be substantially less than the FTA's daytime and nighttime thresholds for adverse community reaction of 80 dBA and 70 dBA L_{eq}, respectively.

4.11.5.2 CEQA Significance Determination

With the exception of criterion a) related to operation and maintenance of Alternative 2, the CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts related to criteria b) through f) would remain less than significant, or there would be no impact.

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Operation and Maintenance

As described in Section 4.11.5.1 (see Table 4.11-7), long-term operation and maintenance noise (i.e., noise from the alternative power plant) under Alternative 2 would be 48 dBA L_{eq} at the Chance Ranch residence. This noise level would exceed the Mono County nighttime exterior noise standard of 40 dBA $L_{eq,}$ and would therefore potentially result in a significant impact. Due to the location of the Alternative 2 power plant site and the necessary open design of the geothermal power plant air-cooled tube condensers, traditional mitigation techniques (e.g., sound walls, blankets, enclosures, etc.) to reduce power plant operation noise by at least 8 dBA would not be practicable or feasible. Therefore, Alternative 2 would result in a significant unavoidable impact.

4.11.6 Alternative 3: Modified Pipeline Alternative

4.11.6.1 Direct and Indirect Impacts

Construction

Under Alternative 3, the geothermal production and injection pipeline route east of U.S. Highway 395 and north of Shady Rest Park would be modified. The Alternative 3 modified pipeline route east of U.S. Highway 395 would not be within the vicinity of any noise receptors; however, the modified route north of Shady Rest Park would be approximately 350 feet closer to the baseball fields than the proposed route. Regardless, the modified route would not be closer to the area noise receptors than the shortest distance described in Table 4.11-3. Therefore, the pipeline construction noise levels presented in Table 4.11-3 are also applicable to Alternative 3, and construction impacts under Alternative 3 would be the same as those described in Section 4.11.4.1 for the Proposed Action.

Compared to the Proposed Action, Alternative 3 would result in a comparable short-term construction impact relative to the Proposed Action because average construction noise levels at nearby noise receptors would be the same as under the Proposed Action.

Operation and Maintenance

Operation and maintenance impacts under Alternative 3 would be the same as those described in Section 4.11.4.1 for the Proposed Action.

Decommissioning

Decommissioning impacts under Alternative 3 would be the same as those described in Section 4.11.4.1 for the Proposed Action.

4.11.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 3 would be less than significant.

4.11.7 Alternative 4: No Action

4.11.7.1 Direct and Indirect Impacts

Under the No Action Alternative, long-term noise and vibration levels in the vicinity of the CD-IV Project site would not be expected to change noticeably from existing conditions.

However, drilling of authorized geothermal exploration wells in Basalt Canyon, not part of the CD-IV Project, could continue per previous NEPA and CEQA analysis and approvals. Therefore, the No Action Alternative could result in similar short-term drilling noise levels at nearby noise receptors as would occur under the Proposed Action (see Table 4.11-3).

The other construction-related activities that would occur under the Proposed Action would not occur. Therefore, compared to the Proposed Action, the No Action Alternative would result in a reduced short-term construction impact relative to the Proposed Action.

4.11.7.2 CEQA Significance Determination

Under the No Action Alternative, the construction and operation of the CD-IV Project would not occur and there would be no short or long term noise related impacts associated with the Project. However, drilling of authorized geothermal exploration wells in Basalt Canyon could continue and the impacts from short-term well drilling noise levels could occur.

4.11.8 Cumulative Impacts

4.11.8.1 Geographic Extent/Context

Noise levels tend to diminish quickly with distance from a source; therefore, the geographic scope for cumulative impacts associated with noise would be limited to projects located within approximately 0.5 mile of the CD-IV Project. The temporal scope for cumulative impacts associated with noise would include the construction, operation, maintenance, and decommissioning phases of the CD-IV Project.

4.11.8.2 Existing Cumulative Conditions

The Project site is located within the Casa Diablo Geothermal Complex, which is currently developed with three geothermal power plants: MP-I, MP-II, and PLES-I. The CD-IV Project would constitute the fourth geothermal power plant in the complex.

4.11.8.3 Reasonably Foreseeable Projects

There are several projects within 0.5 mile of the CD-IV Project that are reasonably foreseeable and could be constructed and/or operated simultaneously with the CD-IV Project, including the MP-I Replacement Project, the Digital 395 Middle Mile Project, and the Sawmill Cutoff Road Reconstruction Project.

4.11.8.4 Construction and Decommissioning

If the cumulative projects identified above are constructed or decommissioned at the same time as the CD-IV Project, the combined construction or decommissioning noise levels at nearby noise receptors could exceed the noise levels estimated for the CD-IV Project (see Tables 4.11-2 and 4.11-3). However, because the CD-IV Project construction and decommissioning noise levels would be relatively low at the nearest sensitive receptors, and the cumulative projects would be at greater distances from the sensitive noise receptors, it is unlikely that cumulative noise levels from construction and decommissioning would result in an adverse effect. There are no quantitative noise data available for cumulative projects within 0.5 mile of the CD-IV Project.

4.11.8.5 Operation and Maintenance

The MP-I Replacement Project would be operated within the Casa Diablo Geothermal Complex, approximately 0.5 mile south of the CD-IV power plant site. This project is anticipated to begin construction in spring or summer of 2012 and will replace the aging MP-I power plant with a new, more modern and efficient binary power plant (M-I). The CD-IV plant site is located approximately 2,000 feet north of the proposed M-1 plant site and the existing MP-I, MP-II, and PLES-I plants. Because the MP-I facility would be replaced with a facility that would include lower noise-generating equipment, the MP-I Replacement Project would not be expected to increase noise levels in the vicinity of existing noise receptors (Mono County, 2012). In addition, the CD-IV power plant would generate long-term noise levels at nearby noise receptors that would be relatively low (see Table 4.11-4); therefore, it is unlikely that cumulative noise levels from operation and maintenance would result in an adverse effect.

4.11.8.6 CEQA Significance Determinations

For the reasons described above, when considered in combination with the impacts of other projects in the cumulative scenario, the CD-IV Project's incremental contribution to noise impacts would not be cumulatively considerable and the cumulative impact would be less than significant.

The CD-IV Project would not cause or contribute to any cumulative vibration or groundborne noise impact.

4.11.9 Mitigation Measures

Mitigation Measure NO-1: ORNI 50, LLC shall prepare and implement a Noise Management Plan to ensure that operational noise levels associated with CD-IV Project well pumps do not increase ambient noise levels at Shady Rest Park by more than 3 dBA. The plan shall be submitted to USFS for review and approval prior to the commencement of well pump operations. The plan shall include a proposal designed by an acoustical engineer to perform baseline noise measurements at Shady Rest Park at locations developed through consultation with USFS and the Town of Mammoth Lakes. The plan shall include a requirement for an acoustical engineer to collect additional measurements at the same locations as the baseline survey once the well pumps are operational to verify that well pump noise levels do not increase ambient noise levels by more than 3 dBA. The plan shall identify specific acoustical engineer-recommended measures to be implemented by ORNI 50, LLC in order to reduce noise levels to within 3 dBA of baseline conditions if the measurements that include pump operations exceed the baseline measurements by more than 3 dBA. Noise control techniques may include, but not be limited to: locating the well pump within an enclosed concrete building, use of noise walls or equivalent sound attenuation structures, and the use of pumps and equipment with special noise control specifications designed to specifically achieve the desired noise reductions.

The plan shall require an acoustical engineer to take additional noise measurements after the noise reduction improvements are implemented to ensure the required noise level is met. In the event that the measured noise levels still exceed the baseline level by more than 3 dBA, additional noise control techniques shall be initiated to correct the violation.

4.11.10 Residual Impacts after Mitigation Incorporated

There would be no residual impacts after mitigation is incorporated.

4.12 Population and Housing

4.12.1 Methodology for Analysis

This analysis of potential environmental consequences of the CD-IV Project and Alternatives focuses on the possible impacts to population and housing. Impacts are identified and evaluated based on relevant BLM and USFS, and local standards, policies, and guidelines.

4.12.1.1 Growth Inducing Effects

The CEQ's *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 CFR Parts 1500-1508; reprinted in CEQ, 2005) provides guidelines for addressing social and economic effects in preparing an environmental impact statement. Section 1508.14 of these regulations states that

> "Human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. . . . This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment.

In Section 1508.8(b), the regulations state that indirect effects of an action "may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."

The analysis of potential socioeconomic effects of the CD-IV Project and Alternatives takes place in the context of physical effects related to population and housing. See Section 4.15, *Socioeconomics and Environmental Justice*, for further discussion of the methodology regarding socioeconomic effects resulting from changes in population and housing.

4.12.2 Project Design Measures

There are no PDMs related to population and housing.

4.12.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to population and housing if it would:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure);

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere; or

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

4.12.4 Alternative 1: Proposed Action

4.12.4.1 Direct and Indirect Impacts

Growth Inducing Effects

Construction

Construction of the Proposed Action would be temporary and is expected to occur in two phases. During Phase I (anticipated to last 8 months) six wells would be drilled, the main pipeline would be constructed, and the first OEC unit would be constructed. The second OEC unit would be constructed in Phase II, along with additional wells and pipeline to support operation of this OEC unit. Although the start date of Phase II is uncertain until further wellfield testing and development has been completed, it is anticipated to last approximately 8 months.

The distance between workers' residences and the construction sites would affect the choice of transportation and decision on whether to engage in "weekly commuting" or other forms of temporary relocation while working on the Proposed Action.

The number of construction workers on-site during Phase I would range from 60 to 80 workers for the proposed power plant, 40 to 60 workers for the pipeline, and 12 to 15 workers per well. During Phase II, 60 to 80 workers would be working on the power plant, 40 to 60 would be working on the pipeline, and 12 to 15 workers per well. The average workforce would range from 10 to 20 workers during low activity periods and 100 to 120 during high activity periods.

Most construction workers are anticipated to come from the local labor pool in unincorporated Mono County and the Town of Mammoth Lakes. It is also possible that some workers would commute to the Project area from Inyo County, including the City of Bishop (approximately 40 miles southeast of Mammoth Lakes).

Since construction is a temporary assignment, it is not expected that workers from outside the Mammoth Lakes area would relocate permanently in order to work at the Project site. Some workers may engage in "weekly commuting," in which they find temporary or transient housing closer to the jobsite during the workweek, typically at motels, rental units, or local campgrounds. It is expected that such workers would seek temporary housing in the Mammoth Lakes area, where both rental housing as well as a large number of hotel or motel rooms would be available.

According to the U.S. Census Bureau's 2006-2010 American Community Survey, Mono County had rental vacancy rate of 12.9 percent over the 2006-2010 period and Mammoth Lakes had a rental vacancy rate of 15.3 percent (CA DOF, 2011). As indicated in Table 3.12-1, there are thousands of vacant units available in Mammoth Lakes and Mono County. In addition, other forms of housing, such as RV facilities and campgrounds, are available that could provide alternative forms of temporary housing. Thus, there would be a sufficient supply of temporary housing options to accommodate workers who may seek temporary housing near the jobsite.

Operation and Maintenance

Because the new power plant would be operated collectively with the existing Casa Diablo Geothermal Complex, only about six new employees would be required for operation of the CD-IV Project. It is anticipated that these workers would either be hired locally or, if hired from outside the Mammoth Lakes area, would relocate to the area. As indicated in Table 3.12-1, there are thousands of vacant units available in Mammoth Lakes and Mono County. As such, there would be minimal impact to the local housing supply or the community, even if all permanent workers were to relocate to the Mammoth Lakes area.

Decommissioning

As in the case of CD-IV Project construction, the temporary decommissioning workforce would likely come mostly from the Town of Mammoth Lakes or unincorporated Mono County. Some workers would likely commute to the Project site. For workers who choose to commute weekly and temporarily relocate to the Mammoth Lakes area during the workweek, it is expected that sufficient numbers of rental properties and hotel and motel accommodations would be available in the area.

4.12.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.12.3.

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

Construction, Operation and Maintenance, and Decommissioning

As discussed above, construction is expected to require an average of 100 to 120 workers with a peak of up to 120 workers over the course of the Proposed Action at any one time. The total population of Mono County is 14,308 and the Town of Mammoth Lakes is approximately 8,286 (see Table 3.12-1). The January 2012 unemployment rate for Mono County was 9.0 percent while the unemployment rate for the Town of Mammoth Lakes was 6.0 percent (EDD, 2012). The majority of the construction, operation, and maintenance workforce is expected to come from the existing labor pool in Mammoth Lakes and Mono County. Due to the temporary nature of construction work, substantial numbers of workers are not expected to relocate permanently to the local area in order to work on the CD-IV Project. Permanent employees, if they are recruited from areas outside the Mammoth Lakes area, may choose to relocate to the area. However, as noted in Section 3.12, there is a sufficient supply of housing to accommodate those workers. Even if all six workers were to relocate to the area, this would not represent substantial growth in either the Town of Mammoth Lakes or Mono County. The decommissioning workforce is anticipated to be similar to the construction period. Although the CD-IV Project would produce additional electricity, it is not expected to produce levels that would indirectly induce growth in the Project area. Therefore, the CD-IV Project would have a less than significant impact on growth, either directly through employment or indirectly through increased electric generating capacity.

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

There is no existing housing on the CD-IV Project site. Development of the CD-IV Project would not displace any housing units and would not require construction of new housing. Consequently, the Proposed Action would cause no impact related to this criterion.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

There are no residents on the CD-IV Project site. The Proposed Action would not displace any people and would not require replacement housing to be built elsewhere. Therefore, the CD-IV Project would cause no impact related to this criterion.

4.12.5 Alternative 2: Plant Site Alternative

4.12.5.1 Direct and Indirect Impacts

Growth Inducing Effects

Construction, Operation and Maintenance, and Decommissioning

The construction, operation and maintenance, and decommissioning workforce for Alternative 2 is expected to be the same as for the CD-IV Project; therefore, there would be a sufficient supply of temporary or permanent housing options to accommodate workers who may seek housing in the Project area.

4.12.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-4 Project. Potential impacts of Alternative 2 would be less than significant for criterion a), and no impact for criteria b) and c).

4.12.6 Alternative 3: Modified Pipeline Alternative

4.12.6.1 Direct and Indirect Impacts

Growth Inducing Effects

Construction, Operation and Maintenance, and Decommissioning

The construction, operation and maintenance, and decommissioning workforce for Alternative 3 is expected to be the same as for the CD-IV Project; therefore, there would be a sufficient supply of temporary or permanent housing options to accommodate workers who may seek housing in the Project area.

4.12.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 3 would be less than significant for criterion a), and no impact for criteria b) and c).

4.12.7 Alternative 4: No Action

4.12.7.1 Direct and Indirect Impacts

Growth Inducing Effects

No jobs would be created related to the CD-IV power plant, wells or pipeline construction that could induce population growth in the area and no housing or people would be displaced. Therefore, Alternative 4 would have no impact with respect to population and housing.

However, under prior approvals, up to 11 geothermal exploratory wells could be drilled in Basalt Canyon. As a result, jobs associated with drilling and constructing wells could be similar to the Proposed Action if exploration is continued, but for five fewer wells.

4.12.7.2 CEQA Significance Determination

Because Alternative 4 would not directly or indirectly induce growth, displace housing, or displace people, there would be no impact regarding the CEQA significance criteria for population and housing.

4.12.8 Cumulative Impacts

The potential for cumulative population and housing impacts exists where there are multiple projects proposed in an area that have overlapping construction schedules and/or project operations that could induce substantial population growth in an area, or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing. Projects with overlapping construction schedules and/or operations could collectively result in a demand for labor that cannot be met by the region’s labor pool, which could lead to an influx of non-local workers and possibly their dependents.

4.12.8.1 Geographic Extent/Context

The CD-IV Project is immediately northeast of U.S. Highway 395 and SR 203, and would be the fourth power plant within a complex that already includes three geothermal power generating facilities. The Casa Diablo Geothermal Complex is across U.S. Highway 395 and approximately 2 miles east of the Town of Mammoth Lakes to the west along SR 203. The local community experiencing the most immediate population and housing impacts from the CD-IV Project would be the Town of Mammoth Lakes and surrounding areas of Mono County.

4.12.8.2 Existing Cumulative Conditions

The largest economic driver of growth in Mono County has been the ski industry and the resort-based second-home community focused on the Town of Mammoth Lakes. In addition, past development of geothermal power generation capacity in the Project area has had an incremental effect on population and housing demand in Mammoth Lakes and Mono County. As the population increases through direct and indirect influences of development, housing demand increases. Past and existing projects would contribute to the cumulative impact of the Proposed Action and Alternatives. These types of past and existing projects, together with the reasonably foreseeable projects described below, could combine with impacts of the CD-IV Project or an Alternative to affect population and housing demand within the geographic extent of this cumulative analysis.

4.12.8.3 Reasonably Foreseeable Projects

Table 4.1-1 in Section 4.1.5, *Cumulative Scenario Approach*, provides a listing of current and reasonably foreseeable projects in the Project area. Most of the other projects listed are urban development or redevelopment projects associated with the Town of Mammoth Lakes, and are part of the routine upkeep of municipal streets, parks, and infrastructure. A new terminal for the Mammoth Yosemite Airport is also planned south of the Proposed Action along U.S Highway 395. A few of the listings, such as the Sierra Star Master Plan Project, are large land development proposals that were planned before the real estate collapse that began in 2008, and may or may not move forward in the foreseeable future in the same form. One geothermal project that could be developed in the vicinity of the CD-IV Project is the MP-I Replacement Project, which could be developed approximately 0.25 mile southeast of the proposed power plant. This project would continue to utilize the existing geothermal resource in Basalt Canyon and use the existing pipeline that connects to the current MP-I power plant. The larger projects presented in Table 4.1-1 have either undergone independent environmental review pursuant to NEPA and/or CEQA or will do so prior to approval. Even if environmental review has not yet been completed for projects determined to be located within the geographic extent of this cumulative analysis, the potential effects of all projects comprising the existing and reasonably foreseeable cumulative conditions relevant to the Proposed Action were considered in the cumulative impacts analyses in this EIS/EIR.

4.12.8.4 Construction

Construction of the CD-IV Project would utilize the same workforce skills as the other geothermal plant development projects in the area. There may also be some construction skill types that would be relevant to both the CD-IV Project and other projects planned in the area, such as construction of a new airport terminal. However, many of the skilled craft trades required for construction of a geothermal power plant, pipelines and wells will be different from the majority of the streets and roads construction projects ongoing within the Town of Mammoth Lakes.

Due to the large surplus of housing currently available in the county, and other forms of available housing such as RV facilities and campgrounds, it is highly unlikely that the cumulative impacts of all of the planned and proposed construction projects combined would have a noticeable impact on population growth or housing displacement in Mammoth Lakes or Mono County. Therefore, no major adverse cumulative impacts would be expected to result.

4.12.8.5 Operation and Maintenance

The Proposed Action is the addition of a fourth geothermal power generation plant to a complex that already contains three existing geothermal plants. All four facilities would be operated by the same workforce, and that workforce would need to be expanded by an estimated six additional workers to handle the fourth power plant. The proposed new terminal for the Mammoth Yosemite Airport will be larger than the existing facilities and may require the addition of a few more employees, and other projects planned as listed in Table 4.1-1 will also likely need a few more people for their ongoing operations once they are built and in place. Given that the Town of Mammoth Lakes and Mono County have a large inventory of available housing, however, it is unlikely that there would be any significant population growth or housing displacement due to the cumulative operation of any or all of the planned and proposed projects.

4.12.8.6 Decommissioning

It is assumed that many of the same impacts that occurred during construction activities would occur during decommissioning, and the CD-IV Project's decommissioning contribution to these cumulative impacts would be approximately the same as described above for construction.

4.12.8.7 CEQA Significance Determinations

The CD-IV Project would have less than significant impacts with respect to the inducement of substantial population growth in the area. The CD-IV Project would not contribute to cumulative impacts regarding displacement of substantial numbers of existing housing or people.

4.12.9 Mitigation Measures

No mitigation measures are required to reduce impacts related to population and housing.

4.12.10 Residual Impacts after Mitigation Incorporated

Because no mitigation measures are recommended, impacts to population and housing would be the same as discussed in Section 4.12.4, *Alternative 1: Proposed Project*.

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4.13 Public Safety, Hazardous Materials, and Fire

4.13.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts to the health and safety of the public from hazardous materials and fire. Studies and other information provided by ORNI 50, LLC also were reviewed, including the following:

1. Mammoth Pacific L.P., Hazardous Materials Business Plan, April 7, 2008.
2. Hadden Environmental Solutions Company, Risk Management Plan, Certification Statement and Executive Summary, Prepared for Mammoth Pacific L.P., June 8, 1999.
3. Upper Basalt Canyon Geothermal Exploration Project, Environmental Assessment, Long Valley KGRA Federal Geothermal Leases CA-11672 and CA-14407, Mono County, California, EA Number: CA-170-05-04, January 2005.
4. Air Liquide, Material Safety Data Sheet, Chemical Name; Class: Pentane and Isomers, August 31, 2005.

4.13.1.1 Hazardous Materials

In order to assess the potential for a release of hazardous materials to affect the public or the environment, this analysis evaluates several aspects of the proposed use of these materials at the facility. It is recognized that hazardous substances must be used at the facility. Therefore, this analysis was conducted by examining the type and amount of chemicals to be used, the manner in which ORNI 50, LLC would use and store the chemicals, the manner by which they would be transported to the facility, and the way in which ORNI 50, LLC would dispose of hazardous wastes.

Engineering and administrative controls concerning the use of hazardous materials are included as part of the Proposed Action. Engineering controls are the physical or mechanical systems, such as storage tanks, secondary containment or automatic shut-off valves, that can prevent the spill of hazardous material from occurring, or that can either limit the spill to a small amount or confine it to a small area. Administrative controls are the rules and procedures that workers at the facility must follow that would help to prevent accidents or to keep them small if they do occur. Both engineering and administrative controls can act as methods of prevention or as methods of response and minimization. In both cases, the goal is to prevent a spill from moving off-site and causing harm to the public.

4.13.1.2 Fire Hazards

This analysis evaluates the potential for construction and operation of the Proposed Action and Alternatives to cause impacts related to a wildland fire by assessing the fire hazard severity zoning of the Project area, the actions that could initiate a wildland fire, and the methods proposed to address fire safety. In addition, the Proposed Action requires the use of a large quantity of flammable liquid in the power plant. Engineering and administrative controls, as described above, act to minimize fire hazards as well, through the use of shut-off valves that can limit the release of flammable materials and by establishing a fire safety plan and procedures to prevent and suppress an incident resulting from a flammable liquid release.

4.13.1.3 Emergency Response

Potential impacts of the Proposed Action and Alternatives on public safety could result if construction or implementation resulted in impaired implementation of an emergency response or evacuation plan.

4.13.2 Project Design Measures

The analysis assumes that the following PDMs related to hazardous materials are fully implemented:

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 (HMBP) 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 Plans

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.

10. *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.

Environmental Monitoring

11. *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 will also conduct regular, routine visual inspections of the well sites and pipeline.

Protection of Erosion and Surface Waters

12. *HYD-1*: Appropriate erosion control measures will be used to control any offsite discharges, and the Project will adopt any relevant LRWQCB and USFS best management practices to prevent soil erosion, including the preparation of a Storm Water Pollution Prevention Plan (SWPPP).

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

4.13.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to hazards and hazardous materials if it would:

a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials;

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within 0.25 mile of an existing or proposed school;

d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would result in a safety hazard for people residing or working in the project area;

f) For a project within the vicinity of a private airstrip, would result in a safety hazard for people residing or working in the project area;

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

4.13.4 Alternative 1: Proposed Action

This analysis of direct and indirect impacts for the Proposed Action is organized according to the following Project phases: construction; operation and maintenance; and decommissioning.

4.13.4.1 Direct and Indirect Impacts

Hazardous Materials

Construction

Hazardous materials anticipated to be used during construction activities include diesel fuel, lubricants, drilling mud and drilling mud additives, paints, and solvents. The use, storage, and disposal of hazardous materials and wastes associated with geothermal drilling, power plant and pipeline construction could result in potential adverse health and environmental impacts if hazardous materials were used, stored, or disposed of improperly. Direct impacts of such releases could include contamination of vegetation, soil, and water, as well as exposure to the harmful effects of these materials. Further indirect impacts to human and wildlife populations could also result.

Geothermal well drilling would be conducted at the well pads according to standard geothermal industry practice and procedures as described in Section 2.2.3.5, *Well Drilling and Construction*. Prior to drilling, ORNI 50, LLC would submit a geothermal drilling permit application to BLM. The permit application requires details of the proposed drilling program and operation plan, including blowout[1] protection program and procedures to protect the environment. Prior to drilling permit issuance, the application and proposed technical program would be reviewed by BLM related to the geothermal resources and by USFS with respect to the surface activities. The Agencies could require additional measures, if needed, as conditions of approval prior to authorization.

A sump/containment basin would be constructed on each well pad to contain drilling mud and rock cuttings from the drilling operations. Prior to construction, ORNI 50, LLC must prepare a SWPPP for review by the LRWQCB (see Section 4.19, *Water Resources*). The SWPPP would describe construction BMPs to be implemented to prevent and contain stormwater discharges and potential releases of geothermal fluid from spills or well blowouts at the well pads during construction. ORNI 50, LLC would adhere to all BMPs established by the USFS and LRWQCB for reducing soil erosion and stormwater runoff (PDM HYD-1). Typical BMPs would reduce the potential for releases of hazardous materials to affect the environment. For example, BMPs would

1 A blowout is an uncontrolled release of geothermal fluid from a well.

require secondary containment and berming of temporary onsite storage areas for diesel fuel, drilling muds and additives, and other hazardous materials used during construction. All equipment and materials storage would be routinely inspected for leaks and records maintained documenting compliance with regulations for the storage and handling of hazardous materials. These types of BMPs would be applicable to geothermal well drilling, pipeline installation, and power plant construction. Additional BMPs specific to geothermal well drilling would ensure that potential releases of geothermal fluids are contained in the drilling sumps to avoid adverse impacts to nearby surface water resources. In addition, ORNI 50, LLC would prepare a Spill or Discharge Contingency Plan and Well Blowout Contingency Plan (PDM HYD-13) to prevent, control, contain, clean up and mitigate the impacts of any large spills of geothermal fluid.

As discussed above, geothermal fluids could be accidentally released to the environment as a result of spills on the well sites or well blowouts. Geothermal fluids contain low concentrations of hazardous materials, but more importantly, could pose a threat to health and safety from the high temperature of the geothermal fluid if released in an uncontrolled manner. Geothermal fluids produced from the well would be at a temperature of approximately 325^{o}F; however, once the geothermal fluid was released to the environment, such has during a well blowout, some of the fluid would flash to steam and the temperature would immediately drop to the temperature of boiling water. Geothermal fluid discharged to the surface would continue to cool and reach safe temperatures within a short while. Direct contact with the initial geothermal fluid discharge, before it cooled, could cause scalding burns and the potential of serious injury. BOPE would be utilized while drilling below the surface casing. Following the cementing of the surface casing for the production wells, BOPE would be installed, tested and ready for use to ensure that geothermal fluids encountered do not flow uncontrolled to the surface. The BOPE would be installed on the well head and kept in operating condition, and tested in compliance with federal regulations and industry standards. During drilling operations, a minimum of 10,000 gallons of cool water and 12,000 pounds of inert, non-hazardous barite (barium sulfate) would be stored at the well site for use in preventing well flow (“killing the well”), if needed.

During well drilling and testing, there is a possibility of encountering hazardous non-condensible gases. The three primary gases expected are steam, hydrogen sulfide, and carbon dioxide. As discussed above, steam can cause burning and serious injury. Hydrogen sulfide is a colorless gas with a rotten egg odor in concentrations under 100 parts per million; above this level it could cause health problems and even death. Carbon dioxide is a colorless, odorless gas that is combustible at concentrations above 5 percent and harmful at high concentrations. Automatic gas detectors would be stationed around the drilling rig. A warning light and horn would flash when dangerous levels are detected. Gas concentrations would diminish with distance from the wellhead to safe levels in the site vicinity. Prior to field work, personnel would be trained according to the Emergency Contingency Plan (PDM HAZ-9) on the appropriate procedures to follow in this event, including notification of local emergency response agencies and other actions as appropriate.

During construction, ORNI 50, LLC or its contractors would store all hazardous materials in the manner specified by the manufacturer and in accordance with local, State, and federal regulations.

In addition, as required under OSHA regulations, all employees would receive training in the proper use, storage and handling of hazardous materials. ORNI 50, LLC or its contractors would be required to implement the BMPs established in the SWPPP to reduce the potential for spills and establish procedures to minimize the effect of accidental releases. Further, ORNI 50, LLC would prepare an Emergency Contingency Plan, (PDM HAZ-9), a Well Blowout Contingency Plan and Spill or Discharge Contingency Plan (PDM HYD-13) which would outline the notification procedures to alert emergency response agencies, as well as measures to be followed to contain and clean up potential releases of geothermal fluid, drilling mud, fuel oils and petroleum products. With compliance with existing regulations and implementation of PDMs, hazards to the workers, the public or the environment would be reduced but would not be completely avoided. The Blowout Contingency Plan is a required component of the geothermal drilling permit application that is reviewed by BLM prior to drilling authorization; however, the other emergency contingency plans are not required. **Mitigation Measure PHS-1**[2] is proposed to require Agency review of emergency contingency plans prior to authorization and ensure that these plans address all potential field-related emergencies, and include adequate emergency measures to protect public health and safety and the environment.

Operation and Maintenance

Project operation would require the routine transport, use and disposal of hazardous materials. Hazardous materials that would be used by the CD-IV Project would be similar as those used by the existing Casa Diablo geothermal power plants in the vicinity, as described in Section 3.13. Bulk storage of hazardous materials for the CD-IV Project would be located at the shared maintenance building and oil storage area. Oils would be used in the turbines and transformers at the power plant; a drum of lubricating oil and anti-scalant, if needed, would be stored at each well pad.

The working fluid proposed for the CD-IV power plant is n-pentane (rather than isobutane, as is currently used by the existing power plants). According to the manufacturer’s Material Safety Data Sheet (MSDS), pentanes are colorless, flammable liquids which can rapidly turn into a gas at standard atmospheric temperatures and pressures, with a gasoline-like odor; these liquids are typically packaged in cylinders under pressure. Inhalation of pentane vapors can cause central nervous system depression, producing symptoms such as headaches, nausea, dizziness, drowsiness and unconsciousness. Inhalation of high concentrations of the vapors may be fatal. Pentane vapors are flammable, are heavier than air, and may spread long distances; distant ignition and flash-back are possible (Air Liquide, 2005).

Numerous federal, state and local regulations ensure the safe transportation, use, storage and disposal of hazardous materials. Prior to power plant operation, ORNI 50, LLC must update its existing HMBP for the Geothermal Complex to include the CD-IV power plant (PDM HAZ-1). The HMBP provides an inventory of hazardous materials, describes emergency response procedures, and demonstrates facility compliance with applicable handling, storage and disposal regulations. The BLM and the Mono County Health Department Environmental Health Division (MCEHD) would review and approve the HMBP, and perform inspections as needed to document compliance.

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[2] See Section 4.13.9 below for all mitigation measures.

In addition, the use of n-pentane requires a Risk Management Plan (RMP) due to the potential risk of explosion and fire. ORNI 50, LLC would update its existing RMP and incorporate the CD-IV facility into its Process Safety Program. Both the HMBP and RMP must be reviewed and approved by the local fire agency with oversight of fire safety at the power plant, the LVFPD. According to Mr. Fred Stump, LVFPD Fire Chief, n-pentane is considered to be a safer working fluid than the isobutane used by the existing plants because it requires approximately 50 percent less product to operate; therefore, a smaller volume would be used and stored at the power plant. In the event of a release, there is sufficient isolation distance surrounding the proposed plant that it would not pose a threat to the surrounding area. For flammable gases such as n-pentane, the safest way to extinguish a fire would be to stop the flow and allow the fire to burn out (Stump, 2011). Engineering and administrative controls are included in the Proposed Action. The proposed power plant would be equipped with gas detection systems, fire suppression and alarm systems, and emergency shutoff valves that would minimize the potential for a substantial release. As required by law, all plant personnel would receive health and safety training in the appropriate procedures to prevent harmful exposures to hazardous materials used at the plant.

Operation of the well field and geothermal fluid pipelines could pose a hazard of exposure to hot geothermal fluid in the event of a well blowout or pipeline rupture. The production of hot geothermal fluid from each well would be flow rate controlled. Pressure limit sensors would automatically shut down each pump in the event of an excessively high discharge pressure. The pumps would be monitored by the power plant computer control systems which would shut down the pumps in the event of a mismatch in the geothermal fluid flow measured to and from the plant (which could result from a pipeline leak). The facility's Blowout Contingency Plan and Spill or Discharge Contingency Plan (PDM HYD-13) would outline procedures to control and contain accidental spills and releases, as well as notification procedures to alert the appropriate local entities if public safety is threatened.

Routine transportation of hazardous materials, particularly n-pentane, to the Project site could create a hazard to the public or the environment if materials were improperly handled or could indirectly result in an incremental increase in the potential for accidents; however, Caltrans and the California Highway Patrol regulate the transportation of hazard materials and wastes, with stringent packaging requirements, licensing and training for hazardous materials truck operators, chemical handlers, and hazardous waste haulers.

With compliance with existing laws and regulations, potential impacts related to the routine use, storage, transportation and disposal of hazardous materials would be reduced but not completely avoided. Implementation of **Mitigation Measure PHS-1** would ensure that emergency contingency plans are reviewed by appropriate agencies and confirm that emergency measures would protect public health and safety and the environment.

Decommissioning

Project decommissioning would require the routine transport and disposal of hazardous materials used at the facility. Hazardous materials, including n-pentane, would be transported offsite by a licensed transporter to an appropriate recycling or disposal facility. Construction equipment and vehicles used for decommissioning of facilities would use diesel fuel or gasoline. Inadvertent releases of hazardous materials from spills or leaks could occur. With compliance with existing laws and regulations, potential impacts related to the routine use, storage, transportation and disposal of hazardous materials would be reduced but not completely avoided. Implementation of **Mitigation Measure PHS-1** would ensure that emergency contingency plans are reviewed by appropriate agencies and confirm that emergency measures would protect public health and safety and the environment.

Fire Hazards

Construction

The Project is located within areas designated as moderate to high fire hazard severity (CAL FIRE, 2007). Wildfires are a concern in the Inyo National Forest, especially in the areas of wildland urban interface surrounding the Town of Mammoth Lakes. The use of construction equipment and temporary onsite storage of diesel fuel could pose a wildland fire risk during construction. The time of greatest fire danger would be during the clearing phase, when people and equipment would be working among vegetative fuels that can be highly flammable. Potential sources of ignition would include equipment with internal combustion engines, gasoline-powered tools, welding equipment or tools that produce a spark, fire, or flame. Such sources would include sparks from blades or metal parts scraping against rock, overheated brakes on wheeled equipment. Smoking onsite by construction personnel would also be a potential source of ignition during construction.

Regulations governing the use of construction equipment in fire-prone areas are designed to minimize the risk of wildland fires during construction activity. These regulations restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors on construction equipment that has 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. As described in PDMs HAZ-3 to HAZ-8, ORNI 50, LLC would equip all construction equipment with spark arrestors and all vehicles with fire extinguishers, cooking or campfires would not be allowed, personnel would only be allowed to smoke in designated areas, and any permits for operations would be obtained from the Inyo National Forest prior to construction. Water trucks used for dust suppression also would be available for firefighting; however, this equipment may not be well suited for fire suppression, where direct application of water would be needed.

Because construction would occur within areas designated as having moderate to high fire hazards during the dry summer months when fire danger is highest, there would be a moderate risk of fire. **Mitigation Measure PHS-2** would require that a Fire Protection and Prevention Plan be developed in consultation with the local fire jurisdictions and approved by the USFS prior to construction. Any additional BMPs required by the USFS shall be implemented. This measure also requires that an adequate number of water trucks equipped with 50 feet of fast response hose with fog nozzles, be onsite during construction for immediate response to fire incidents. With compliance with regulations, implementation of PDMs and **Mitigation Measure PHS-2**, the potential hazard from fires during construction would be reduced, but impacts would not be completely avoided.

Operation and Maintenance

Power plant operations involve the use of n-pentane, a flammable liquid, as the working fluid for energy exchange. The principal methods of accident prevention in the Proposed Action include equipment design safeguards, written procedures, and operator/employee training. The power plant design features include pressure safety systems, n-pentane and fire detection systems, a fire suppression system, a water storage tank and pump, and automatic emergency shutdown systems to ensure the safe operation of the facility. The preliminary fire suppression system design has been submitted to the LVFPD for initial review; the final designs and Risk Management Plan would also be submitted to the LVFPD for review prior to permit approval. According to Mr. Fred Stump, LVFPD Fire Chief, n-pentane is considered safer than isobutane, which is used as the working fluid at the existing facilities, because less product is required for operation. The facility would be required to comply with all OSHA regulatory programs for process safety management, emergency action planning, hazardous waste operations and emergency response planning.

The proposed power plant would be located within a forested area surrounded by flammable vegetation. If uncontained, a fire at the plant would have the potential to spread to adjacent areas. In addition, a wildland fire would have the potential to burn in close proximity to the plant, potentially exposing the facility and its personnel to a substantial risk of loss, injury or death. As required by fire regulations, the facility would be constructed with a 30-foot defensible space cleared of vegetation surrounding the plant structures to provide protection with respect to wildland fires. Because the proposed plant would be designed with fire protection systems and there is sufficient isolation distance surrounding the proposed plant, it is not considered to present a fire threat to the nearby Town of Mammoth Lakes (Stump, 2011).

Routine operations and maintenance in the geothermal well field would require vehicle trips to the well sites, occasional transport of lubricating oil, and maintenance of the geothermal fluid pipeline. Project activities in moderate to high fire hazard areas have the potential to result in fire hazards if proper precautions were not taken. With compliance with existing fire safety regulations and PDMs HAZ- 4 through HAZ-8, which require fire extinguishers for construction activities and an emergency fire pump for fire suppression, designated smoking areas, and adherence to all fire permit requirements, the impact of fire hazards to the public and the environment would be reduced, but not completely avoided. **Mitigation Measure PHS-2** is proposed to require that ORNI 50, LLC prepare a Fire Protection and Prevention Plan in consultation with local fire jurisdictions for approval by USFS prior to construction and operation of the geothermal facility.

Decommissioning

Activities related to decommissioning of facilities would involve similar construction vehicles and equipment and, therefore, the potential impacts related to fire would be similar to those described above for construction. Project activities in moderate to high fire hazard areas have the potential to result in fire hazards if proper precautions were not taken. With compliance with existing fire safety regulations, and PDMs HAZ- 4 through HAZ-8, which require fire extinguishers for construction activities and an emergency fire pump for fire suppression, designated smoking areas, and adherence to all fire permit requirements, the impact of fire hazards to the public and the environment would be reduced, but not completely avoided. Mitigation Measure PHS-2 would require that ORNI 50, LLC prepare a Fire Protection and Prevention Plan in consultation with local fire jurisdictions for approval by USFS prior to construction and operation of the geothermal facility.

Emergency Response

Construction

Project construction would occur in undeveloped areas, primarily accessed by secondary National Forest System Roads. Project construction would not interfere with emergency evacuation routes designated by the Town of Mammoth Lakes, such as SR 203 and Mammoth Scenic Loop Road. Further, in accordance with PDM TRA-3, construction vehicles would not be permitted to block Sawmill Road (03S25) or Sawmill Cutoff Road (03S08) (see Section 4.16, *Traffic, Transportation and Circulation*).

As discussed above, ORNI 50, LLC would prepare emergency contingency plans for Project construction that outline procedures for notification and prompt response to emergency situations that could arise during construction, such as fires, well blowouts, gas releases, spills. While implementation of safe work practices and precautions during construction would reduce the potential need for emergency response, training of construction workers in appropriate emergency response actions, as outlined in emergency response plans, would minimize the effect on such an event on construction workers, the public, and the environment. Although the potential for impacts would be reduced, they would not be completely avoided. **Mitigation Measures PHS-1** and PHS-2 would ensure that emergency response providers are consulted during contingency and fire plan preparation and that appropriate measures are implemented to protect public health and safety.

Operation and Maintenance

Project operation would not interfere with emergency evacuation routes designated by the Town of Mammoth Lakes. All Project personnel would receive health and safety training, including training on appropriate emergency response actions in the event of emergency situations which could occur during geothermal facility operations, such as fires, well blowouts, gas releases and spills. While potential for impacts would be reduced by compliance with existing regulations and implementation of PDMs, they would not be completely avoided. Mitigation Measures PHS-1 and PHS-2 would ensure that emergency response providers are consulted during contingency and fire plan preparation and that appropriate measures are implemented protect public health and safety.

Decommissioning

Similar to construction, Project decommissioning would require the use of trucks and construction vehicles primarily on secondary NFSRs. Road closures would not be needed, therefore, decommissioning would not physically interfere with designated emergency evacuation routes. ORNI 50, LLC’s emergency contingency plans would be applicable to decommissioning activities.

As above, implementation of **Mitigation Measures PHS-1 and PHS-2** would ensure that emergency response providers are consulted during contingency plan and fire plan preparation and that appropriate measures are implemented protect public health and safety.

4.13.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.13.2.

a) *Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials.*

As described above in Section 4.13.4.1 in the discussion of Hazardous Materials, construction, operation and decommissioning of the CD-IV Project would require the routine transport, storage, use, and disposal of hazardous materials. Compliance with existing hazardous materials regulations would ensure that hazards to construction workers, the public, and the environment from the routine transport, use, or disposal of hazardous materials during construction would be less than significant.

b) *Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.*

As discussed above in Section 4.13.4.1 in the discussion of Hazardous Materials, the storage and use of hazardous materials necessary for the CD-IV Project could create a hazard to the public or the environment if an upset or accident were to occur. Although CD-IV Project construction, operation and decommissioning would comply with all laws and regulations related to hazardous materials, the potential for unanticipated accidents exists, including well blowouts, pipeline rupture, hazardous gas release, and spills or leaks of hazardous materials. ORNI 50, LLC would update its existing HMBP and RMP for the existing Casa Diablo Geothermal Complex to incorporate the proposed CD-IV facilities. Construction would require preparation of a SWPPP that would describe site-specific BMPs for preventing storm water and other geothermal fluid releases and containing them should they occur. The LRWQCB would review the SWPPP and ensure that proposed measures are adequate to protect water quality (see Section 4.19, *Water Resources*). Additionally, ORNI 50, LLC proposes to prepare emergency contingency plans (PDM HAZ-9 and HYD-13) to provide guidance to field personnel and management in the event of an uncontrolled well flow, pipeline break or other field related emergency. To ensure that emergency contingency plans prepared by the ORNI 50, LLC, are protective of construction workers, the public, and the environment, **Mitigation Measure PHS-1** requires that these plans be submitted to local emergency response providers, the BLM, and the USFS for review and consultation prior to BLM approval of the application. With implementation of **Mitigation Measure PHS-1,** the CD-IV Project would not create a significant hazard to the public or the environment resulting from a release of hazardous materials and the impact would be less than significant.

c) *Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school.*

There are no schools located within 0.25 mile of the CD-IV Project site; therefore, Proposed Action would cause no impact related to this criterion.

d) *Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 and, as a result, would create a significant hazard to the public or the environment.*

According to searches of the DTSC Envirostor and the SWRCB Geotracker databases of regulatory agency lists of hazardous materials sites, including those compiled pursuant to Government Code Section 65962.5, the CD-IV Project is not proposed on a known hazardous materials site (DTSC, 2011; SWRCB, 2011).Therefore, the Proposed Action would cause no impact related to this criterion.

e) *For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would result in a safety hazard for people residing or working in the project area.*

The CD-IV Project would not be located within an airport land use plan or within two miles of a public airport or public use airport. Therefore, it would cause no impact related to this criterion. The Mammoth Yosemite Airport, located approximately four miles southeast, is the nearest airport to the CD-IV Project.

f) *For a project within the vicinity of a private airstrip, would result in a safety hazard for people residing or working in the project area.*

Because the CD-IV Project would be outside the vicinity of the private airstrip, this criterion was determined to be inapplicable or to result in no impact.

g) *Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.*

Project construction, operation and decommissioning would not interfere with an adopted emergency response or evacuation plan. As discussed in Section 4.13.4.1, under Emergency Response, the Mono County Emergency Operations Plan (Mono County Sherriff's Department, 2007) outlines actions that would activate the Emergency Operations Center, describes potential scenarios within the County that could require emergency response, and describes agencies responsible for responding to various types of emergencies. The CD-IV Project would not interfere with the established response actions and no emergency evacuation routes are specifically designated. The Town of Mammoth Lakes has designated SR 203 and Mammoth Scenic Loop Road as emergency evacuation routes; the CD-IV Project would not obstruct these routes. Therefore, the impact would be less than significant.

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

As discussed above in Section 4.13.4.1 under Fire Hazards, wildfires are a particular concern in the Project vicinity. Although compliance with regulations for construction in fire-prone areas would reduce the potential for accidental fires, **Mitigation Measure PHS-2** would require that a Fire Protection and Prevention Plan be developed in consultation with the local fire jurisdictions and approved by the USFS prior to construction. Any additional BMPs required by the USFS shall be implemented. This measure also requires that an appropriate number of water trucks equipped with 50 feet of fast response hose with fog nozzles be onsite during construction for immediate response to fire incidents. With compliance with regulations, implementation of PDMs and Mitigation Measure PHS-2, the potential hazard from fires during construction would be less than significant.

Power plant operations would involve the use of n-pentane, a flammable liquid, as the working fluid for energy exchange. The principal methods of accident prevention include equipment design safeguards, written procedures, and operator/employee training. The power plant design features include pressure safety systems, a combustible gas detection system, a fire suppression system, and automatic emergency shutdown systems to ensure the safe operation of the facility. The preliminary fire suppression system design has been submitted to the LVFPD for initial review; the final designs and RMP would also be submitted to the LVFPD for review prior to permit approval. **Mitigation Measure PHS-2** requires that the USFS and local fire jurisdictions review and approve the Fire Protection and Prevention Plan, which would include specific measures for maintenance of defensible space and emergency response to fires.

With implementation of **Mitigation Measure PHS-2**, the impact of fire hazards on public safety and health and the environment would be less than significant.

4.13.5 Alternative 2: Plant Site Alternative

4.13.5.1 Direct and Indirect Impacts

Hazardous Materials

Potential hazardous materials impacts during construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Compliance with existing laws and regulations would reduce potential impacts from the use or release of hazardous materials, but impacts would not be completely avoided. **Mitigation Measure PHS-1** is proposed to require Agency review of emergency contingency plans prior to authorization and ensure that these plans address all potential field-related emergencies that could result in a release of hazardous materials, and include adequate emergency measures to protect public health and safety and the environment.

Fire Hazards

Potential impacts associated with fire hazards during the construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Compliance with existing laws and regulations would reduce potential impacts of fire, but impacts would not be completely avoided. **Mitigation Measure PHS-2** would require that ORNI 50, LLC prepare a Fire Protection and Prevention Plan in consultation with local fire jurisdictions for approval by USFS prior to construction and operation of the geothermal facility.

Emergency Response

Potential impacts on emergency response during construction, operation and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Compliance with existing laws and regulations would reduce potential impacts of fire, but impacts would not be completely avoided. **Mitigation Measures PHS-1 and PHS-2** would ensure that emergency response providers are consulted during contingency and fire plan preparation and that appropriate measures are implemented to protect public health and safety.

4.13.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 2 would be less than significant with implementation of **Mitigation Measures PHS-1 and PHS-2**.

4.13.6 Alternative 3: Modified Pipeline Alternative

4.13.6.1 Direct and Indirect Impacts

Hazardous Materials

Potential hazardous materials impacts during construction, operation and decommissioning of Alternative 3 would be the same as described for the Proposed Action. Compliance with existing laws and regulations would reduce potential impacts from the use or release of hazardous materials, but impacts would not be completely avoided. **Mitigation Measure PHS-1** is proposed to require Agency review of emergency contingency plans prior to authorization and ensure that these plans address all potential field-related emergencies that could result in a release of hazardous materials, and include adequate emergency measures to protect public health and safety and the environment.

Fire Hazards

Potential impacts associated with fire hazards during the construction, operation and decommissioning of Alternative 3 would be the same as described for the Proposed Action. Compliance with existing laws and regulations would reduce potential impacts of fire, but impacts would not be completely avoided. **Mitigation Measure PHS-2** would require that ORNI 50, LLC prepare a Fire Protection and Prevention Plan in consultation with local fire jurisdictions for approval by USFS prior to construction and operation of the geothermal facility.

Emergency Response

Potential impacts on emergency response during construction, operation and decommissioning of Alternative 3 would be the same as described for the Proposed Action. Compliance with existing laws and regulations would reduce potential impacts of fire, but impacts would not be completely avoided. **Mitigation Measures PHS-1 and PHS-2** would ensure that emergency response providers are consulted during contingency and fire plan preparation and that appropriate measures are implemented to protect public health and safety.

4.13.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Potential impacts of Alternative 3 would be less than significant with implementation of **Mitigation Measures PHS-1 and PHS-2**.

4.13.7 Alternative 4: No Action

4.13.7.1 Direct and Indirect Impacts

Under this alternative, the BLM would not approve the proposed CD-IV Project. Direct and indirect impacts related to the construction, operation and decommissioning of the power plant and pipelines would not occur.

However, drilling of geothermal exploration wells could still occur for the geothermal exploration wells that have already been authorized by BLM. The potential impacts were analyzed in previous NEPA and CEQA documents and include the potential for accidental releases of geothermal fluids and hazardous materials used during drilling, the potential for fires associated with geothermal drilling operations, and the potential need for emergency response.

If Alternative 4 were implemented, fewer hazardous materials would be utilized during construction, as the proposed power plant and pipeline would not be built. In addition, the use of hazardous materials, such as n-pentane, for Project operation and maintenance would not occur. The fire hazards of construction and operation would also be reduced. As a result, the No Action Alternative would have less impact than the Proposed Action related to public health and safety.

4.13.7.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Alternative 4 would result in reduced impacts on public health and safety relative to the CD-IV Project.

4.13.8 Cumulative Impacts

4.13.8.1 Geographic Extent/Context

The geographic scope for cumulative impacts from public health and safety generally encompasses the Project area and surrounding community of the Town of Mammoth Lakes, with the exception of cumulative impacts specifically relating to the transportation of hazardous materials. The geographic scope for transportation-related hazardous materials impacts would extend to include the roadways over which hazardous materials and wastes are transported. Accidents involving transporters of hazardous materials could result in locations relatively remote from the Project site, whereas hazardous materials impacts and other hazards discussed in this section are typically highly localized.

Various types of projects could contribute to the cumulative impact of the Proposed Action and alternatives, including existing and proposed geothermal developments, housing development projects, public infrastructure, and recreational trail system projects. These types of past, current and future projects could combine with potential impacts of the Proposed Action or an alternative to affect public health and safety within the geographic extent of this cumulative analysis.

Most of these projects have either undergone independent environmental review pursuant to NEPA and/or CEQA or would do so prior to approval. Even if environmental review has not been completed for the cumulative projects described in Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, their effects were considered in the cumulative impacts analyses in this EIS/EIR.

4.13.8.2 Existing Cumulative Conditions

The Project area consists of open space land within the Inyo National Forest, where there is little likelihood of encountering significant soil or groundwater contamination, based on a lack of existing and proposed uses that involve hazardous materials. Fire hazards are considered moderate to high in the Project area and surrounding areas. The existing power plants at the Casa Diablo Geothermal Complex use similar types and quantities of hazardous materials as would the Proposed Action.

4.13.8.3 Reasonably Foreseeable Projects

A wide variety of past, present, and reasonably foreseeable future development projects could contribute to the cumulative conditions for public health and safety in regards to emergency response in the cumulative analysis area. Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the Project site and surrounding area that were used to develop this analysis of cumulative effects for public health and safety.

4.13.8.4 Construction

Cumulative impacts associated with construction of the Proposed Action and all alternatives would be limited to those projects under construction at the same time and general location as the CD-IV Project. Hazardous materials anticipated to be used during construction activities include diesel fuel, lubricants, drilling mud and drilling mud additives, paints, and solvents which could cause potential adverse impacts resulting from spills or releases. Geothermal fluids or non-condensible gases could also be accidentally released to the environment as a result of spills on the well sites or uncontrolled releases from the wells (“well blowouts”). ORNI 50, LLC would handle, use, and dispose of all hazardous materials in accordance with local, State, and federal regulations, including BMPs set forth in the SWPPP. **Mitigation Measures PHS-1 and PHS-2** would ensure that emergency contingency plans contain measures to adequately protect public health and safety and the environment from accidental releases.

The CD-IV Project is located within areas designated as moderate to high fire hazard severity (CalFIRE, 2007). If construction of multiple projects overlapped in high fire hazard areas, particularly in areas where access and haul roads would be shared, there could be a cumulative increase in wildland fire risk. The potentially compounded increase in wildland fire risk could place an additional burden on local fire departments, particularly if access for emergency vehicles were impeded. Compliance with all fire prevention regulations related to the use of construction equipment in fire-prone areas and implementation of PDMs and Mitigation Measures related to fire safety would reduce the contribution to any localized cumulative wildland fire impacts as a result of construction of the Proposed Action, although the impacts would not be completely avoided.

While the impacts of well drilling under the CD-IV Project are similar to those associated with other geothermal wells in the area, these impacts would be site-specific and would not overlap in time. No additional construction activities are anticipated to occur in the vicinity at the same time as construction. Therefore, it is unlikely that CD-IV Project-related construction impacts related to hazardous materials would result in a combined impact that would cause an adverse cumulative effect.

4.13.8.5 Operation and Maintenance

Operation and maintenance of the Proposed Action, Alternative 2 and Alternative 3 would occur over approximately the next 30 years, and would require the routine use of hazardous materials, similar to those used by the existing and proposed geothermal projects (MP-II, PLES-I, and MP-I Replacement) at Casa Diablo. These existing and proposed projects are within the same geographic area and temporal period, and would cause operational impacts like those of the CD-IV Project, including the potential for accidental fires or releases of hazardous materials. Therefore, the impacts of these projects could be cumulative with those of the CD-IV Project.

The operation of all of the Casa Diablo geothermal projects requires compliance with existing laws and regulations designed to reduce the potential for release of hazardous materials and to minimize the harmful effects of such as release. Because the MP-I Replacement Project and the CD-IV Project propose the use of n-pentane rather than isobutane as the working fluid in the power plants, which would reduce the volume of working fluid to be used and stored on-site, there would be no net increase from the existing volume of flammable working fluid stored at the Casa Diablo Geothermal Complex when both of these projects are fully operational (Stump, 2011). Further, the proposed CD-IV plant location would have sufficient isolation distance that a release of flammable working fluid would not affect the other geothermal plants; consequently, it is unlikely that Project-related impacts related to a release of flammable working fluid would result in a combined impact that would cause an adverse cumulative effect.

The CD-IV Project would cause an incremental increase in the amount of fuels, lubricants, and other hazardous materials used and stored at the power plant and well field. The potential impacts of a hazardous materials release would be site-specific and are not expected to combine with similar impacts of past, present, or reasonably foreseeable projects. Therefore, when considered in combination with the impacts of the other projects, it is unlikely that CD-IV Project-related impacts related to the storage and use of hazardous materials would result in a combined impact that would cause an adverse cumulative effect.

Hazardous materials, such as flammable n-pentane, and wastes would be transported on local and regional roadways. If numerous cumulative projects were constructed concurrently, traffic volumes on roadways and the related risk of transportation-related hazardous materials incidents could increase. Transportation of hazardous materials, however, is subject to regulations to reduce the potential for accidents resulting in releases of hazardous materials. Compliance with these regulations would ensure that impacts related to transport of hazardous materials would be minimized and/or avoided. Further, because the CD-IV Project has a relatively low number of truck trips associated with transportation of hazardous materials to and from the CD-IV Geothermal Complex, the CD-IV Project’s contribution to a cumulative impact related to the transportation of hazardous materials would be low. Therefore, when considered in combination with the impacts of the other projects, it is unlikely that CD-IV Project-related impacts from the transport of hazardous materials would result in a combined impact that would cause an adverse cumulative effect.

Operation and maintenance of the No Action Alternative would not involve the transportation, storage, use or disposal of hazardous materials and would not contribute to an adverse cumulative effect.

4.13.8.6 Decommissioning

Impacts of decommissioning of the Proposed Action and Alternatives (including the No Action Alternative, assuming that any approved geothermal wells constructed would need to be properly abandoned) would be similar to construction impacts and would be primarily related to an inadvertent release of hazardous materials from facilities and construction equipment and potential fire hazards of operating equipment and vehicles in terrain with a moderate to high fire hazard. Similar to construction discussed above, this impact would be site-specific and would not be expected to combine with similar impacts of past, present, or reasonably foreseeable projects. **Mitigation Measures PHS-1 and PHS-2** would ensure that emergency contingency plans contain measures to adequately protect public health and safety in the event of an accident, and the impacts would not be cumulatively considerable.

4.13.8.7 CEQA Significance Determination

For hazards and hazardous materials, there would be no Project-specific impacts related to the development of the CD-IV Project on a known hazardous materials site, within 0.25 mile of an existing or proposed school, or within 2 miles of a private airstrip. In addition, there would be no impacts on adopted emergency response or evacuation plans. Consequently, the CD-IV Project would not contribute to cumulative impacts in that regard. The Proposed Action's individual impact resulting from accidents or upsets involving the release of hazardous materials into the environment during construction, operation and maintenance, and decommissioning would be less than significant with implementation of **Mitigation Measure PHS-1**. Similarly, the CD-IV Project's individual impact resulting from wildland fire during construction, operation and maintenance, and decommissioning would be less than significant with implementation of **Mitigation Measure PHS-2**. For the reasons discussed above in Sections 4.13.8.4 through 4.13.8.6, the Project's individual impacts from wildland fire and from the accidental release of hazardous materials would be site-specific and would not be expected to combine with similar impacts of past, present, or reasonably foreseeable projects. Consequently, the CD-IV Project's incremental contribution in that regard would not be cumulatively considerable and the cumulative impact would be less than significant.

4.13.9 Mitigation Measures

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.

4.13.10 Residual Impacts after Mitigation Incorporated

Although unlikely, following implementation of the PDMs and mitigation measures provided above, it is possible that an accidental hazardous material release could occur and could cause a public health and safety risk to individuals or the environment. No other residual impacts to public health and safety would be expected to occur as a result of construction, operation and maintenance, and/or decommissioning of the CD-IV Project or an alternative.

4.14 Recreation

This section describes the impacts associated with construction, operation, and decommissioning of the Proposed Action or its Alternatives with respect to recreational resources within the Proposed Action area.

4.14.1 Methodology for Analysis

Methods used to assess potential impacts on recreational resources included site visits to the Project area in 2010 and review of local planning documents and maps to identify the recreational resources in the Project vicinity that, because of their proximity, could be directly or indirectly affected by the Proposed Action or its Alternatives. Construction and operations activities were assessed for their potential to result in direct and indirect adverse impacts on recreational resources given the proximity of the identified recreation resource, the type of recreational activity expected to occur, and the availability and proximity of alternative recreational resources.

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the potential impacts to recreation. Impacts are identified and evaluated based on relevant BLM and USFS standards, policies, and guidelines, including the LRMP, and Inyo National Forest Travel Management Plan. Additional studies and other information were reviewed, including the following:

1. Mono County General Plan.
2. Town of Mammoth Lakes General Plan.
3. Mammoth Lakes Trail System Master Plan.
4. Eastern High Sierra Recreation Topo Map.

4.14.1.1 Trails and Roads

Local planning documents and maps were reviewed to identify the roads, bicycle routes, and trails that serve as recreational resources within the Project vicinity and that, because of their proximity, could be directly or indirectly affected. Recreational resources in the Project vicinity include roads and trails that are used for walking, jogging, bicycling, off-highway vehicle (OHV) use, snowmobiling, cross-country skiing, and snow shoeing. In addition, there are designated bicycle routes in the Project vicinity.

To determine the potential for construction and operations activities to cause direct effects on USFS roads, bicycle routes, and trails, the proposed construction areas were compared with the locations of identified recreational resources (Figures 3.14-1 and 3.14-2). Potential indirect effects on recreational resources were identified through the same means, as well as by reviewing the impact findings presented in other pertinent sections of this EIS/EIR. For example, indirect effects that typically result from other environmental impacts and that could adversely affect the recreational experience include construction- and operations-related noise along recreational routes.

4.14.1.2 Recreation Facilities and Sites

Local planning documents and maps were reviewed to identify recreation facilities located in the Project vicinity, which includes Shady Rest Park, and three campgrounds nearby. To determine the potential for construction and operations activities to cause direct effects on recreation facilities and sites, the CD-IV Project areas were compared with the locations of identified recreational resources. Potential indirect effects on recreational resources were also identified by reviewing the impact findings presented in other pertinent sections of this EIS/EIR. For example, indirect effects that typically result from other environmental impacts and that could adversely affect the recreational experience include construction-related noise in the vicinity of recreation facilities.

4.14.2 Project Design Measures

The analysis assumes that the following PDMs related to recreation are fully implemented:

1. *LU-1*: 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).

2. *TR-2*: Project vehicles will not block Sawmill Road or Sawmill Cutoff Road by either waiting or parking on either road.

3. *TR-3*: 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.

4. *TR-5*: 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.

5. *TR-6*: 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 and on other unimproved roads in the project area.

6. *REC-1*: Sections of the pipeline route not located next to existing roads will be monitored for evidence of use by 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.

7. *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.

8. *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.

9. *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.

10. *AQ-2*: ORNI 50, LLC will also comply with any requirements prescribed by the 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 PERP.

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

12. *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.

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

14. *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.

15. *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.

16. *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.

17. *VIS-2*: In sections of the Project area with a USFS Visual Quality Objective (VQO) of “partial retention” and “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.

18. *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 SR 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.

19. *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.

20. *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.

4.14.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to recreation if it would:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated; or

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

Based on the nature of the CD-IV Project, there would be no impact related to criterion b), because the Proposed Action and its Alternatives do not include recreational facilities and no construction would occur at neighborhood parks or schools that are used for recreation. The CD-IV Project would not result in neighborhood population growth or residential housing that would require the construction or expansion of additional recreational facilities. Therefore, this significance criterion is not applicable, and is not discussed further.

4.14.4 Alternative 1: Proposed Action

This analysis of direct and indirect impacts for the Proposed Action is organized according to the following phases: construction; operation and maintenance; and decommissioning.

4.14.4.1 Direct and Indirect Impacts

Trails and Roads

Construction

Construction of the geothermal power plant, geothermal wells, associated pipelines, and road relocation would be in close proximity or within several designated trails and unpaved USFS and County-maintained roads used for recreational activities. In addition, construction vehicles would access the Alternative 1 sites via Sawmill Road (03S25) and Antelope Road (03S05), which are County-maintained roads with USFS numbers used for recreational activities and Sawmill Cutoff Road (NFSR 03S08) and Pole Line Road (NFSR 03S123), which are NFSRs. NFSR 03S129E would be closed to public access within the fence line of the proposed CD-IV power plant. Road closures would occur 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.

Construction activities would occur primarily in the non-winter seasons of 2013 and 2014 (and potentially 2015), and would increase use of Alternative 1 area roads and trails shown on Figure 3.14-1, which are also used for walking, jogging, bicycling, and OHV uses. Roads 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. In addition, other roads and underground crossings may be temporarily closed during construction. Alternative 1 includes several PDMs that would reduce the effect of construction activities in the vicinity of roads and trails used for recreational activities. Public use and access of Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08) will be maintained during Alternative 1 construction (PDM TR-2). In addition, where pipelines would cross existing roads, requiring restriction of public access, traffic control measures will be established to warn road users of temporary road closures (PDM TR-3). In addition, the road closures and restrictions would be short-term and there are nearby roads that would serve as detours for these roads, including detours that allow Knolls Loop recreation users to connect to the sections of the loop adjacent to closed portions. Alternative 1-related vehicles will be restricted to designated access routes and would be restricted to traveling no faster than 25 miles per hour on Sawmill Cutoff Road (NFSR 03S08) and other unpaved roads in the Alternative 1 area (PDM TR-6). However, speeds of 25 miles per hour by construction vehicles could result in conflicts and public safety hazards with recreation use of the area, particularly in areas with blind corners, narrow roads, or hills.

To reduce short-term air quality and noise effects, dust control and emissions control measures (PDM AQ-1 through AQ-4) and noise control measures (PDM NOI-1 through NOI-3) would be implemented. Finally, each drilling pit will be fenced when the drill site is not continuously staffed until the pit is backfilled (PDM REC-3) to avoid public safety impacts, particularly for bicyclists or OHV users that travel at rates of speed such that open pits may not be noticed if not they are not fenced and identified.

While the above described PDMs would reduce potential construction phase recreation effects, the public safety of road and trail recreation users could be affected during Project construction. In addition to Alternative 1 PDMs, **Mitigation Measure REC-1** (see Section 4.14.9 below) would reduce temporary, construction-related recreation impacts by requiring ORNI 50, LLC to post informational materials about the Project at nearby recreation sites / campgrounds, access points, and the Mammoth Welcome Center. This material would include construction schedules and safety information regarding trucks and other heavy equipment use on County-maintained Roads and NFSRs, and identify route closures. In addition, construction vehicle speeds would be limited to 15 miles per hour.

Operation and Maintenance

Operation of the geothermal power plant and wells would include air emissions controls (AQ-4). While ambient noise levels would be increased in the immediate vicinity of the power plant and wells, trail and road users passing these sites would be in the vicinity of these facilities for brief periods. Therefore, substantial long-term air quality and noise impacts on recreation users would not occur.

Project siting would require some vegetation and tree removal at the plant and well facility locations, which would slightly alter the forested character of the Project sites. As described in Section 4.18, *Visual Resources*, at Project sites adjacent to Shady Rest Park (including well facility 38-25), Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08), the clearance of trees would be more noticeable to motorists and recreationists along these roads. Implementation of PDMs VIS-1 through VIS-3, and LU-1 would help reduce the visibility of well facilities and the geothermal pipelines. Although these well sites would still be surrounded by a dense stand of trees, tree removal activities along these roadways could still be perceived as a negative visual impact by recreationists. However, the overall forest character of the Project vicinity would largely remain intact.

Pipelines will be located away from existing roads and/or screened by existing vegetation or terrain (PDM VIS-2) and the pipelines in areas of higher visual quality value and all wells and the power plant will be of textures and color/colors that blend in with the environment (PDM VIS-3 and VIS-4). As described in Section 4.18, *Visual Resources*, recreationists along Sawmill Cutoff Road (NFSR 03S08) may notice the “expansion loops” or square bends along the production pipeline route, where the pipeline lengthens and shortens. To reduce the visual impact of the proposed geothermal pipeline in this area, ORNI 50, LLC would implement PDMs VIS-1 and VIS-3, which would require that any pipeline route selected within the pipeline corridor either be 300 feet from the developed portions of Shady Rest Park or be substantially screened from view from the developed portions of the park by topography or vegetation and that the selected pipeline route not parallel Sawmill Cutoff Road (NFSR 03S08) within 300 feet of the road. However, as shown in Figure 4.18-2, a segment of the pipeline connecting to well facility 15-25 parallels Sawmill Road (03S25) within 300 feet of the road. Similarly, near well facilities 14-25 and 34-25, the proposed geothermal pipeline would cross Sawmill Cutoff Road (NFSR 03S08). Although the pipeline would be constructed beneath the road, recreationists would have immediate views of the pipeline on either side of Sawmill Cutoff Road (NFSR 03S08). Implementation of **Mitigation Measure VIS-1** (**Landscape Plan**), which includes immediate landscaping in front of the pipeline in locations where the pipeline would be clearly visible from Sawmill Cutoff Road (NFSR 03S08), would help screen views of the pipeline.

In addition, from Knolls Loop, recreationists would have immediate views of the production pipeline crossing over the injection pipeline (or vice versa) in the vicinity of well facility 34-25. At this particular site, recreationists using Knolls Loop could have immediate views of this pipeline crossing. Implementation of **Mitigation Measure VIS-1** (**Landscape Plan**), which includes immediate landscaping in front of the pipeline crossing where the pipeline would be clearly visible from Knolls Loop, would help screen views of the pipeline. Nonetheless, even with landscaping and given the height of these crossovers, the pipeline crossovers would be clearly visible to recreationists. Implementation of **Mitigation Measure VIS-2** (**Underground Pipeline Crossovers**), which requires belowground installation of either the existing pipeline, new injection pipeline or production pipeline, would minimize the visibility of such pipeline crossovers and would thereby reduce adverse visual effects on recreationists using Knolls Loop.

Pipeline routes could be seen as attractive for use by OHVs, as they would constitute new linear areas clear of vegetation. Therefore, sections of pipeline routes not located next to existing roads will be monitored for evidence of OHV use and if such use is identified, further OHV use would be prevented through posting of signs and the physical blocking of access, or other restriction measures (PDM REC-1). 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 for construction of the existing Basalt Canyon pipeline, which has successfully revegetated). However, PDM REC-1 only addresses pipelines not located next to existing roads and while catwalking has resulted in successful revegetation at the existing Basalt Canyon pipeline, any failure of revegetation efforts for the CD-IV Project could attract use by OHVs. Therefore, **Mitigation Measure REC-2** would require monitoring of all pipelines for evidence of use by OHVs, vegetation monitoring and replanting, if necessary.

PDM HAZ-9 requires an emergency contingency plan that includes preventative actions, equipment requirements, and response notifications and follow up procedures in the event of a field emergency, such as uncontrolled well flow or pipeline break. Implementation of this measure would ensure the safety of recreationalists in the vicinity of Alternative 1 facilities.

Under the Proposed Action Sawmill Cutoff Road (NFSR 03S08) may continue to be plowed for winter access, as currently occurs, continuing to limit use of Sawmill Cutoff Road (NFSR 03S08) by OSV winter users. The geothermal power plant site is in an area available to dispersed camping and the available area for dispersed camping would be slightly reduced as a result of the Proposed Action. Existing informal shooting that occurs on Antelope Springs Road in the vicinity of the proposed geothermal power plant site would relocate to other areas of the forest. Operation of the geothermal power plant and some of the well facilities would require long-term closure of some portions of NFSRs to motorized use, and as shown on Table 2-3. These roads would continue to be available for non-motorized use. While road closures would reduce the overall amount of roads available for motorized recreation use in the Project vicinity, roads that require closure would not restrict overall motorized access through the area because there are other nearby roads that provide access around the closed road segment. Further, roads would be closed to motorized use at the nearest intersection with another road, with the exception of NFSR 03S129E, where only the section of road within the power plant fenceline would be closed to public access. Closure of roads at the nearest intersection would avoid the creation of dead ends that can lead to development of unauthorized trails.

Siting of Proposed Action Facilities, as well as plowing and other road maintenance activities that would occur under the Project (as described in Section 2.2.7.3, *Access Road Maintenance and Plowing*) would change the nature of the recreation experience of the Project area. The geothermal plant, well facilities, and pipelines would introduce additional human made structures to the vicinity as viewed by road/trail users and cross-country recreation users. Some recreationists would prefer use of the roads under the CD-IV Project that have more maintenance (i.e., fewer ruts, smoother surfaces), while other recreationists seeking a more rustic experience would prefer the less maintained conditions of roads that currently exist.

Proposed well pipelines include a route that would run parallel to Sawmill Road (03S25), which serves as a popular recreation road and intersects with several other roads that serve recreational uses, particularly in the winter. Further, there are other locations where pipelines would cross NFSRs that provide recreation opportunities. During winter months, these roads are often used for snowmobiling and cross country skiing. The concentration of pipelines and well facilities near Shady Rest Park and the existing over snow vehicle (OSV) staging area, coupled with the existing topography, trees, and grade changes in the area, could result in confusion and safety hazards as OSV and other recreation users attempt to cross the Project area from the staging area to areas to the northwest commonly used for open riding. Further, the siting of pipelines would affect cross country recreation opportunities. Plowing and other road maintenance activities could encourage higher speeds by OSV and other motorized recreation uses. In addition, plowing could create grade changes that could result in public safety impacts, particularly for cross-country OSV users that travel at rates of speeds such that grade changes may not be noticeable if they are not identified. Finally, Alternative 1-related vehicles will be restricted to designated access routes and will be restricted to traveling no faster than 25 miles per hour on Sawmill Cutoff Road (NFSR 03S08) and other unpaved roads in the Alternative 1 area (PDM TR-6). However, speeds of 25 miles per hour by operational vehicles could result in conflicts and public safety hazards with recreation use of the area, particularly in areas with blind corners, narrow roads, or hills.

Similar to the above description of winter recreation use, non-winter recreation users entering the Project area from Shady Rest Park would be somewhat constrained by the location of the pipelines, and conflicts between recreation users and with operational vehicles could occur. Further, the siting of pipelines would affect cross country recreation opportunities. Road maintenance activities could encourage higher speeds by OHV and other motorized recreation uses. Finally, Alternative 1-related vehicles will be restricted to designated access routes and will be restricted to traveling no faster than 25 miles per hour on Sawmill Cutoff Road (NFSR 03S08) and other unpaved roads in the Alternative 1 area (PDM TR-6). However, speeds of 25 miles per hour by operational vehicles could result in conflicts and public safety hazards with recreation use of the area, particularly in areas with blind corners, narrow roads, or hills. **Mitigation Measure REC-3** would require that information regarding access routing be provided at nearby recreation sites / campgrounds, access points, and the Mammoth Welcome Center. In addition, operational vehicle speeds would be limited to 15 miles per hour and road signage would be installed, consistent with USFS and County requirements.

The presence of underground pipeline crossings would not result in locations of snowmelt that could pose safety hazards. As described in Section 2.2.4.2, *Pipeline Alignment*, 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 below grade. In addition, the casing pipe would be insulated.

Decommissioning

After decommissioning, recreational users would experience a beneficial impact compared to Project conditions as the Alternative 1 sites would be restored to an undeveloped state and would be available for recreational use (see Section 2.2.8, *Project Decommissioning*). Public use of NFSRs used for recreation would be restored.

Recreation Facilities and Sites

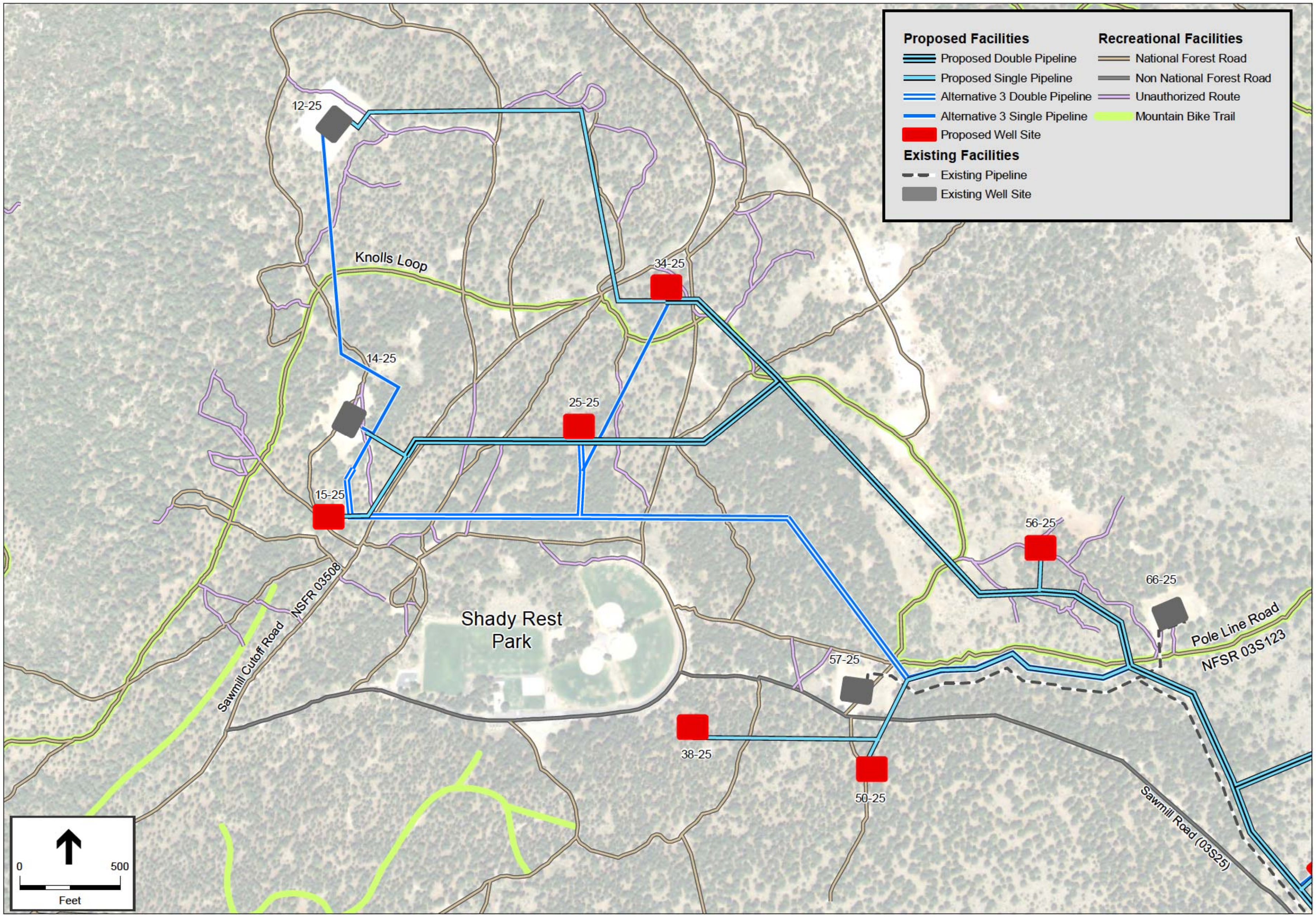
Construction

Construction of the geothermal power plant, geothermal wells, and associated pipelines would be in the vicinity of Shady Rest Park and campgrounds (Figure 4.14-1). Construction at Alternative 1 sites would not directly interfere with use of recreation sites. However, the presence of slower moving construction vehicles could result in delays in access to recreation sites. Alternative 1-related vehicles will be restricted to designated access routes (PDM TR-6). In addition, **Mitigation Measure REC-1** would reduce temporary, construction-related recreation impacts by requiring ORNI 50, LLC to post informational materials about the CD-IV Project at nearby recreation sites / campgrounds, access points, and the Mammoth Welcome Center. This material would include construction schedules and safety information regarding trucks and other heavy equipment use on County-maintained roads and NFSRs, and identify route closures.

To reduce short-term air quality and noise effects, dust control and emissions control measures (PDM AQ-1 through AQ-4) and noise control measures (PDM NOI-1 through NOI-3) would be implemented.

Operation and Maintenance

Similar to construction phase activities, operational vehicles could be increased along the entrance road to Shady Rest Park and could result in delays in access to Shady Rest Park, which is a popular staging area for snowmobilers and cross country skiers. The addition of vehicular traffic associated with Project maintenance activities in the vicinity of the OSV staging area could result in safety hazards near the staging area. ORNI 50, LLC will “attempt” to work with the Town of Mammoth and the USFS to plow the road and the parking lot at Shady Rest Park (the location of the OSV staging area) under PDM TR-5; however, that coordination is not required under PDM TR-5 and public safety hazards could occur if PDM TR-5 does not require coordination to be implemented. Therefore, **Mitigation Measure REC-3** requires ORNI 50, LLC to coordinate with the Town of Mammoth and the USFS to ensure that the OSV staging area, and road access to the staging area, is plowed during winter.



SOURCE: USFS, 2011; Ormat, 2011

Casa Diablo IV Geothermal Development Project . 209487

Figure 4.14-1

Shady Rest Area Recreational Facilities

Operation of the geothermal power plant and wells would include air emissions controls (AQ-4). While ambient noise levels would be increased in the immediate vicinity of the power plant and wells, recreational facilities would not be in the immediate vicinity of the power plant and most wells. As discussed in Section 4.11, *Noise*, noise levels from the well pump at Well Site 38-25 would likely be audible at the baseball fields at Shady Rest Park. Although well pump noise would not be expected to be disruptive, considering the typically noisy nature of activities conducted at the park, the USFS has recommended implementation of mitigation under NEPA to ensure that there would be no adverse effects related to disturbance of Shady Rest Park users (see Mitigation Measure NO-1).

Pipelines will be located away from existing roads and/or screened by existing vegetation or terrain (PDM VIS-2). In addition, the pipelines in areas of higher visual quality value and all wells, including those located near Shady Rest Park, will be of textures and color/colors that blend in with the environment (PDM VIS-3 and VIS-4). Therefore, the presence of Alternative 1 facilities would not appear as visual intrusions that affect the recreation experience of recreational facility users.

Decommissioning

After decommissioning, recreational facility users would experience a beneficial impact compared to the proposed CD-IV Project as operational vehicles that could cause delays in access to Shady Rest Park would no longer be present.

4.14.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.14.3.

a) *Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated.*

Construction

As described above, Alternative 1 construction activities would result in short-term access restrictions to some trails and roads. In addition, some recreationists who currently use the Alternative 1 area and vicinity for activities such as hiking, bicycling, or dispersed camping would not want to use these areas due to construction activities. Some recreationists may instead use other similar regional recreational facilities and roads/trails, resulting in occasional increases in use of other recreational facilities and roads/trails. However, given the availability of recreation opportunities in the region, such as the hundreds of miles of NFSRs and unauthorized roads, increased use of regional recreational facilities and roads/trails would not result in substantial physical deterioration of recreational resources, or otherwise result in physical degradation of existing recreational resources, and the impact would be *less than significant*.

Operation and Maintenance

As described above, some road segments would be closed where the power plant and well facilities are sited on existing roads. Therefore, recreation use on nearby roads would increase somewhat to accommodate for detours away from closed areas. In addition, similar to construction phase impacts, some recreationists may instead use other similar regional recreational facilities and roads/trails, resulting in occasional increases in use of other recreational facilities and roads/trails. However, given the availability of recreation opportunities in the region, such as the hundreds of miles of NFSRs and unauthorized roads, increased use of regional recreational facilities and roads/trails would not result in substantial physical deterioration of recreational resources, or otherwise result in physical degradation of existing recreational resources, and the impact would be *less than significant*.

Decommissioning

Upon decommissioning, these lands would be available for recreation use, as described above.

4.14.5 Alternative 2: Plant Site Alternative

4.14.5.1 Direct and Indirect Impacts

Alternative 2 would result in the same types of construction, operations and maintenance, and decommissioning recreation-related impacts as the Proposed Action and would have the same direct effect on NFSRs and road crossings, and nearby recreation facilities and sites. However, the power plant site would be to the east of the existing power plant, and would avoid closure of NFSR 03S129E. In addition, the two pipelines that would extend north south from the power plant and would cross the unpaved Old Highway 395 under Alternative 1 would not be required. However, the Alternative 2 power plant siting would require closure of a portion of NFST 28E207, which is a motorized trail, 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 that are used by recreationalists (see Figure 4.4-3). However, pipeline crossings would be below ground. Similar to Alternative 1, the Alternative 2 plant site is in an area that can be used for dispersed camping. Therefore, Alternative 2 would have similar recreation effects as compared to Alternative 1.

4.14.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for Alternative 1. Similar to Alternative 1, potential impacts of Alternative 2 would be less than significant.

4.14.6 Alternative 3: Modified Pipeline Alternative

4.14.6.1 Direct and Indirect Impacts

Alternative 3 would result in the same types of construction, operations and maintenance, and decommissioning recreation-related impacts as the Proposed Action and would have the similar effects on NFSRs and road crossings, and nearby recreation facilities and sites. While the pipeline routes under Alternative 3 would differ compared to Alternative 1, Alternative 3 pipelines would cross Knolls Loop and Sawmill Road (03S25) the same number of times as Alternative 1 (Figure 4.4-2). In addition, 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.

4.14.6.2 CEQA Significance Determination

CEQA significance determinations could be similar to that of Alternative 1, should the number of well pads, access road, and pipelines be less than under Alternative 1. Similar to Alternative 1, potential impacts of Alternative 3 would be less than significant.

4.14.7 Alternative 4: No Action

4.14.7.1 Direct and Indirect Impacts

Under this Alternative, the BLM would not approve the CD-IV Project. Direct and indirect impacts related to the construction, operation and decommissioning of the power plant and pipelines would not occur.

However, impacts related to drilling of geothermal exploration wells could still occur for the geothermal exploration wells that have already been authorized by BLM and are not considered part of the CD-IV Project. These impacts, analyzed in previous NEPA and CEQA documents, include construction phase hazards to recreation users in the vicinity of construction area, and air quality and noise effects on recreation users.

If Alternative 4 were implemented, direct effect on NFSRs and road crossings, and nearby recreation facilities and sites would not occur.

4.14.7.2 CEQA Significance Determination

CEQA significance determinations could be reduced compared to that of Alternative 1, because access roads, pipelines, and some wells would not be included. Similar to Alternative 1, potential impacts of Alternative 4 would be less than significant.

4.14.8 Cumulative Impacts

4.14.8.1 Geographic Extent/Context

The geographic scope of the cumulative effects analysis for recreation includes the northeastern portion of the Mammoth Lakes region of Inyo National Forest. This geographic scope was established based on the boundaries of the affected recreation resources, which includes NFSRs that serve and/or connect to other portions of the Mammoth Lakes region of Inyo National Forest.

4.14.8.2 Existing Cumulative Conditions

The Project area consists of open space land within the Inyo National Forest, in the vicinity of NFSRs and trails, Shady Rest Park, and three campgrounds nearby.

4.14.8.3 Reasonably Foreseeable Projects

Projects identified on the cumulative projects list on Table 4-1 that could result in cumulative recreation impacts include:

1. Town of Mammoth Lakes Parks and Recreation Master Plan (2011) – includes potential park improvements throughout the Town of Mammoth, including Shady Rest Park.
2. Town of Mammoth Lakes Trail System Master Plan (2011) – includes potential trail improvements throughout the Town of Mammoth, including the Shady Rest Park area.
3. MP-I Replacement Project – includes improvements at the existing Mammoth Pacific Plant.
4. Residential and other Town of Mammoth development projects – development projects could result in increased population, visitation, and/or employees.
5. Existing Shady Rest OSV staging area and proposed USFS relocation and reconstruction of the Shady Rest OSV staging area to a location to the north of Shady Rest Park OSV, with potential plowing and/or trail construction connecting the proposed staging area to the Town of Mammoth.
6. Community-led initiative to designate and formalize mountain bike trails in project vicinity.
7. Existing Mammoth Pacific L.P geothermal complex operations (geothermal plant, wells, and pipelines).

4.14.8.4 Construction

The construction schedule for the CD-IV Project would begin in the spring of 2013 and continue until December 2013. Construction would also occur during the non-winter months of 2014, and potentially 2015. Past, current, and future projects could require construction activities that use the same access routes as the CD-IV Project, but are not expected to result in the physical degradation of any recreational facilities. These projects, when combined with past projects and the CD-IV Project, would not have a cumulatively considerable contribution to impacts on recreation resources.

4.14.8.5 Operation and Maintenance and Decommissioning

The increase in development associated with cumulative projects would be expected to result in an increase in residents and workers—as well as visitors, shoppers, and tourists—to the Town of Mammoth Lakes, who would collectively be expected to increase the use of recreational facilities and trails/roads in the region. However, the Town of Mammoth Lakes and Inyo National Forest includes extensive outdoor recreation opportunities. In addition, the Town of Mammoth Lakes Recreation and Parks Master Plan and Trail System Master Plan would result in improvements to recreation resources in the Project vicinity. It is expected that sufficient recreation opportunities are available to serve the cumulative projects and increased use of regional recreational facilities would not result in substantial physical deterioration of recreational resources, or otherwise result in physical degradation of existing recreational resources due to the CD-IV Project and the cumulative projects. Existing conflicts between OSV and other recreation uses and existing pipelines and well facilities currently occur. However, relocation and reconstruction of the Shady Rest Park OSV staging area to a location to the north of Shady Rest Park would move the staging area to a location with fewer CD-IV Project pipelines and well facilities that would need to be crossed to access open areas popular for OSV use. Therefore, potential recreation conflicts and safety hazards would be reduced under cumulative project conditions. Formalization and designation of mountain bike trails in the Project vicinity would improve circulation in the Project area, but would need to be coordinated with the Project to identify routes that are consistent with the location of Project facilities. As described above, Project siting would require some vegetation and tree removal at the plant and well facility locations, which would slightly alter the forested character of the Project sites. However, implementation of PDMs and mitigation measures would reduce adverse effects on recreationists. Noise from Well Site 38-25 would likely be audible at Shady Rest Park. However, the noise would not be expected to be disruptive, considering the typically noisy nature of activities conducted at the park. None of the cumulative projects would be expected to have additional visual resources and noise effects on recreationists beyond those described for the Project. These projects, when combined with the CD-IV Project, would not have a cumulatively considerable contribution to impacts on recreational resources. The impact would be less than significant.

4.14.8.6 CEQA Significance Determination

CEQA cumulative impacts would be the same as described above.

4.14.9 Mitigation Measures

The following measures would be required to avoid or reduce impacts on the quality of the human environment. The following mitigation measures would avoid or minimize impacts on recreation:

> **Mitigation Measure REC-1:** ORNI 50, LLC shall post informational materials about the CD-IV Project at, but not limited to: nearby recreation sites / campgrounds, access points, the Mammoth Lakes Trail System website, 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. Signage shall be designed to function during winter and non-winter conditions, and shall be consistent with USFS and Town of Mammoth signage requirements, as appropriate. 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, but not limited to: nearby recreation sites / campgrounds, access points, the Mammoth Lakes Trail System website, and the Mammoth Lakes Visitor Center. Signage shall be designed to function during winter and non-winter conditions, and shall be consistent with USFS and Town of Mammoth signage requirements, as appropriate. 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 a Shady Rest OSV staging area and access to the staging area is plowed to provide winter access. In addition, banks formed by road plowing shall be shaped such that crossing grade changes are gradual in areas where cross country use is prevalent.

In addition, implement **Mitigation Measures VIS-1 though VIS-3** (see Section 4.18.9).

4.14.10 Residual Impacts after Mitigation Incorporated

Following implementation of mitigation measures provided in Section 4.14.9, all adverse impacts on recreation resulting from construction, operations and maintenance, and decommissioning of the CD-IV Project and Alternatives would be avoided or substantially reduced.

4.15 Socioeconomics and Environmental Justice

4.15.1 Methodology for Analysis

For the socioeconomic and environmental justice analyses, population, housing, employment, and unemployment rate data from federal and state agencies were compared to labor force projections during operations and construction estimates for the CD-IV Project. These comparisons were evaluated under the significance indicators presented below. The applicable standards, policies, and guidelines were presented in Section 3.15.2, and are mirrored in the NEPA indicators described below.

A report on the anticipated economic benefits of the CD-IV Project was prepared for Ormat Technologies by Wahlstrom & Associates that provided additional detail about Project spending and economic effects (2012). The report relied on construction workforce numbers in a different format from those provided by ORNI 50, LLC in its Application for Geothermal Drilling, Commercial Use, Site License, and Construction Permit (2012). The project description in the Application referred to personnel requirements in terms of the peak number of workers, which were expected to reach a maximum of 120 workers on site at any one time. The Wahlstrom report, on the other hand, measures employment in terms of the total number of annual-equivalent jobs that would be directly created over the 16-month to two-year construction period. In that analysis, construction activities are estimated to be creating the equivalent of 180 jobs, each lasting a full construction year, spread out over the entire construction period.[1]

4.15.1.1 Housing and Community

NEPA provides no specific thresholds of significance for socioeconomic impact assessment. Significance varies, depending on the context of the proposed action (40 CFR 1508.27[a]), but 40 CFR 1508.8(b) states that indirect effects may include those that are growth inducing and others related to induced changes in the pattern of land use, population density, or growth rate. BLM and USFS concerns in Mono County likely will closely mirror those typically addressed for California projects subject to CEQA regarding impacts on housing and community character. Specific concerns include availability of housing for workers necessary for construction, operation, and decommissioning of the CD-IV Project; potential for inducing population growth in the area; and potential for displacing substantial numbers of people necessitating the construction of replacement housing.

[1] The report estimated a workforce which would be the equivalent of 180 full-time construction jobs for a year. The equivalent of 2 other jobs also would be directly created by construction activities through the Applicant's spending on other support services (e.g., transportation for employees and equipment) for a total of 182 jobs. Additionally, the report estimated that 46 of those workers would come from Mono or Inyo counties. In addition, another 57 jobs would be created through indirect and induced effects for a total of 103 jobs created in Mono and Inyo Counties.

4.15.1.2 Regional Employment, Economy, and Fiscal Resources

A second set of BLM and USFS concerns likely will be the degree to which the CD-IV Project affects the regional economy, through job creation and generation of revenue for local government operations. Specific concerns include the potential for creation of additional jobs, both permanent and temporary positions, expansion of the Mono County economy through spending on the CD-IV Project and by new employees within Mono County, and potential for generating net incremental revenues to local agency jurisdictions in Mono County for their operations.

4.15.1.3 Environmental Justice

BLM and USFS follow the federal regulations and guidance described in Section 3.15.2.1 regarding environmental justice concerns. From the population and demographic data presented in Section 3.15.1.1, however, it was demonstrated that minority population percentages in Mono County and in the Town of Mammoth Lakes are not meaningfully greater than the minority population percentages for the state of California. Similarly, the analysis of income distributions in Section 3.15.1.3 demonstrated that the concentrations of persons living below the poverty level in Mono County and the Town of Mammoth Lakes are not meaningfully greater than the percentage living in poverty for California as a whole. As a consequence, minority and low income communities do not exist in any substantial concentration in either Mono County or the Town of Mammoth Lakes, and thus, there is little likelihood of environmental justice effects occurring. For this reason, environmental justice will not be addressed further in the analysis of Alternatives presented below.

4.15.2 Project Design Measures

There are no PDMs related to socioeconomic or environmental justice issues.

4.15.3 CEQA Significance Criteria

CEQA Guidelines Section 15382 states, “An economic or social change by itself shall not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant.” CEQA Guidelines Appendix G provides guidance as to when impacts related to population and housing could result in significant effects. Based on this guidance, the CD-IV Project would cause adverse impacts to population and housing for purposes of CEQA if it would:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure);

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere; or

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

4.15.4 Alternative 1: Proposed Action

4.15.4.1 Direct and Indirect Impacts

Housing and Community

Construction

Construction employment and spending is the primary mechanism by which the CD-IV Project would cause a socioeconomic impact. Construction would be temporary and is expected to take place primarily over a 16-month to two-year period, subject to cessation or slowdown of activities during the winter snow months. Given the absence of existing economic uses on the site, other than the three current power generation installations, their pipelines and well fields operated by ORNI 50, LLC, Project construction would not displace any current economic activity.

The residential location of construction workers is a key factor determining the extent of potential impacts to the local housing market and community character. Income from employment and its use to rent temporary housing units primarily would benefit the communities in which the construction workers and their families reside because this is where most household expenditures occur.

As described in Section 2.2.6.3, construction employment is estimated to peak at a maximum of 120 workers on site at any one time. The total construction employment is anticipated to create the equivalent of 180 full time jobs, of which 46 are expected to be held by residents of Mono or Inyo counties (Wahlstrom & Associates, 2012, p. 7). Although not likely to all be on site at the same time, the power plant could require 60 to 80 workers during each phase of construction, the pipeline another 40 to 60 workers, with 12 to 15 workers being involved in well drilling and preparation of well pads.

Some of these workers would be recruited locally, though most would be specialized craft workers from outside the Mono County area. Typically, non-local skilled craft workers do not bring families with them for short-term construction assignments, but rather rent temporary space in the local rental housing market, stay in local hotels, or bring RV and trailer home units to local RV parks and campgrounds.

Mono County is characterized by relatively high vacancy rates in its rental housing market, as was presented in Section 3.15.1. If all of the 134 construction workers expected to come from outside the region (i.e., 180 total minus 46 local Mono and Inyo residents) were to rent housing in Mono County, there are more than 1,000 vacant units currently for rent on a long-term basis. The Mono County housing market could accommodate the entire anticipated peak workforce without generating any direct displacement in the housing market.

A temporary increase in the number of occupied units in rental housing, hotels, and RV/campgrounds during the two-year construction period would be perceived as beneficial by owners of such housing types and businesses that would be supported by the beneficial economic effects of increased occupancy. However, in 2011, the average annual wage for construction workers in Mono County is $40,839, which is 19.6 percent higher than the average annual wage for all employed persons in the County (Economic Profile System-Human Dimensions Toolkit, 2012). An influx of workers with higher-than-average pay could increase the demand for rental housing and increase rental prices. This could negatively affect existing occupants of rental housing or others seeking rental housing in Mono County. However, this effect would likely be negligible due to the existing excess of available rental housing.

Operation and Maintenance

As was described in Section 2.2.5, the CD-IV Project would be operated by only about six additional employees beyond those currently employed to operate their three existing power plants. The geothermal complex would continue to be staffed 24/7 with a combination of existing and new employees (ORNI 50 LLC, 2013). There are currently approximately 800 unemployed people in the Mono County labor force. It is possible that all six new operations positions could be filled by current Mono County residents, creating no impact on the local housing market. At the other extreme, if all six jobs were filled by new people moving into Mono County, and each jobholder brought an entire household with them, the Mono County housing market has more than adequate capacity to absorb all six new households with no displacement in the housing market. On the contrary, having additional income to pay for the cost of housing would be seen as beneficial to housing providers in Mono County, either to support new residents or existing residents.

Decommissioning

At the end of the useful life of the proposed power plant and associated pipelines and wells, the facilities would need to be decommissioned. It is assumed that at its maximum scale, a decommissioning and demolition/restoration process would be comparable in terms of employment requirements to the construction process. A two-year decommissioning process would then create temporary housing needs and beneficial impacts on the Mammoth Lakes and Mono County communities comparable to those experienced during the two-year construction cycle. At the conclusion of the decommissioning process, the local communities would be left with six fewer jobs, and if these former workers were to migrate away, it could reduce long-term housing demand by a maximum of six housing units in Mono County.

Regional Employment, Economy, and Fiscal Resources

Construction

As was described above under Housing and Community, the Mono County regional economy and the local economy, defined as the Town of Mammoth Lakes, are easily large enough to absorb the approximately 134 temporary construction workers expected to come from outside the region over the two-year construction period envisioned. The new employment, regardless of whether the jobs are filled by existing residents or short term non-local workers, would generate a temporary benefit to the local and regional economies. The anticipated direct spending on labor costs and contracts within Mono and Inyo counties associated with the employment for local firms would be $5,655,000 (Wahlstrom & Associates, 2012, Appendix G). Additionally, non-local construction workers would spend money on temporary lodging, food and beverage, and other sundry purchases. The value of this indirect economic benefit to Mono and Inyo counties is estimated at $6,741,000 (Wahlstrom & Associates, 2012).

ORNI 50, LLC anticipates that although it would not purchase or rent equipment and materials required to construct the power plant, pipeline, and well site facilities from local suppliers, it would spend $179,000 in Mono and Inyo counties associated with leasing office space, transporting Ormat employees and equipment to and from the Project site, and other Project-related costs (Wahlstrom & Associates, 2012). This spending activity associated with construction of the Proposed Action would have a small, positive effect on local and regional businesses in Mono County. To the extent that temporary employees bring their families with them, or the extent to which construction jobs are filled by local residents, a greater portion of their household expenditures supported by construction incomes would likely be captured by businesses in Mammoth Lakes and Mono County creating a somewhat larger beneficial economic impact. Through economic multiplier effects, the direct spending by ORNI 50, LLC on construction would have small additional beneficial economic expansion impacts through indirect and induced effects. The total economic benefits captured locally through direct, indirect, and induced multiplier effects are estimated to be $13,383,000 (Wahlstrom & Associates, 2012). A minor portion of the economic activity thus generated would also be captured by municipal and county revenue systems through such mechanisms as the local share of the retail sales tax, and County permit requirements for construction.

Operation and Maintenance

Ongoing operation and maintenance of the Project would generate beneficial economic impacts through the same mechanisms that were described above for construction, although at a much smaller scale. The six new permanent jobs in the county would each have an average annual salary of $100,000, resulting in a total of approximately $600,000 per year in new job wages with benefits being in addition (Wahlstrom & Associates, 2012). Operation of the proposed facilities would also likely create occasional spending within the local and regional economies for supplies, services, and repairs, estimated at $225,000 (Wahlstrom & Associates, 2012). Through economic multiplier effects, the direct spending by ORNI 50, LLC on operation and maintenance (including wages and salaries for the new workers) would have small additional beneficial economic expansion impacts through indirect and induced effects. Due to altered recreational conditions in the Shady Rest area, some minor localized economic indirect effects could occur if recreational use habits change.

As described above for construction effects, spending by six additional workers and by the Project operators on materials and equipment would create minor beneficial revenue impacts on municipal and county systems through the local sales tax and other miscellaneous revenue sources. Of more importance, 25 percent of the $700,000 in royalties paid to the federal government from the geothermal fluid produced by the CD-IV Project are returned to Mono County. This would be a direct beneficial fiscal effect of ongoing Project operations. Mono County would receive $175,000 per year (Wahlstrom & Associates, 2012).

Decommissioning

Decommissioning would likely have a short-term beneficial stimulus effect on the local and regional economies as workers are employed to decommission and demolish facilities, and restore the site. At the conclusion of the decommissioning process, not only would that stimulus effect cease, but the local and regional economies would shrink in proportion to the loss of the six ongoing permanent jobs supported by the facilities. The fiscal revenues associated with Project operations would also drop by the same proportion.

4.15.4.2 CEQA Significance Determination

The CEQA issues identified in the Significance Criteria presented in Section 3.15.2.2 are essentially the same as those analyzed above in the NEPA discussion, especially the analysis of impacts on Housing and Community, and require no further analysis here for construction, operation and maintenance, or decommissioning. The Proposed Action would have no impact in regard to CEQA criteria a), b), or c).

4.15.5 Alternative 2: Plant Site Alternative

4.15.5.1 Direct and Indirect Impacts

Housing and Community

Both the proposed plant site and the alternative plant site would be in remote locations and separated from the Town of Mammoth Lakes and other community concentrations of housing within Mono County. In terms of impact on housing markets and community character, there is no distinguishable difference between development on the alternative site from development on the proposed site. Impacts would be the same during all three phases, construction, operation and maintenance, and decommissioning.

Regional Employment, Economy, and Fiscal Resources

Similarly, in terms of impact on regional employment, economy, and fiscal resources, due to the remote nature of the power generation facilities there is no distinguishable difference between development on the alternative site from development on the proposed site. Economic and fiscal impacts would be the same for all Action Alternatives during all three phases, construction, operation and maintenance, and decommissioning.

4.15.5.2 CEQA Significance Determination

Due to the remote nature of the power generation facilities, separate from existing communities, there is no distinguishable difference between development on the alternative site from development on the proposed site. Impacts of concern to CEQA review would be the same for Action Alternatives during all three phases, construction, operation and maintenance, and decommissioning.

4.15.6 Alternative 3: Modified Pipeline Alternative

4.15.6.1 Direct and Indirect Impacts

Housing and Community

Construction

To the extent that the modified pipeline alternative would require somewhat more effort to construct access roads (0.1 mile or 13 percent more than Alternative 1) and somewhat less effort to construct the pipeline (0.1 mile or 1 percent less than Alternative 1), there could be a slight increase or decrease, respectively, in the number of construction workers employed to complete that segment of the CD-IV Project. Overall however, the impacts on the housing markets and community character of the Town of Mammoth Lakes and Mono County would be similar to the Proposed Action. The scale of these differences would likely be so small as to make Alternative 3 indistinguishable from Alternative 1 (the Proposed Action) for its impact on Housing and Community

Operation and Maintenance.

The modified pipeline alternative would not be likely to create operating or maintenance effects large enough to require an increase or decrease in employment from the six O&M staff currently envisioned.

Decommissioning

Similar to the construction impacts, the decommissioning process could have a very small influence on the amount of labor and cost effort required to decommission the facility for Alternative 1 compared with Alternative 3. The ongoing benefits of operations would disappear from the local economy under the Action Alternatives.

Regional Employment, Economy, and Fiscal Resources

Construction

To the extent that the modified pipeline alternative would require somewhat more or less effort to construct, there could be a slight difference in construction spending and employment between Alternative 3 and Alternative 1. The stimulus effect on the local economy would be slightly larger or smaller in proportion.

Operation and Maintenance

It is unlikely that there would be any distinguishable difference in the economic impact of operations and maintenance between the modified pipeline alternative and the Proposed Action.

Decommissioning

To the extent that the modified pipeline alternative is slightly easier or harder to decommission and remove, it could have a very small difference in short-term economic impact between Alternative 3 and Alternative 1. The ongoing benefits of operations would disappear from the local economy under both alternatives.

4.15.6.2 CEQA Significance Determination

CEQA concerns are essentially the same as those addressed above for the Proposed Action. The potential differences in impacts between Alternative 3 and Alternative 1, if any, would be very small and in proportion to the level of employment required to construct and decommission the facilities.

4.15.7 Alternative 4: No Action

4.15.7.1 Direct and Indirect Impacts

Under the No Action Alternative, BLM would not approve the CD-IV Project. Direct and indirect impacts related to the construction, operation and decommissioning of the power plant or pipelines would not occur. However, in Basalt Canyon up to 11 additional wells which were authorized in previous NEPA and CEQA documents may be drilled for exploratory purposes.

If the No Action Alternative were implemented, no changes would be implemented on the power plant site and the existing environmental setting described in Chapter 3 would be maintained. Consequently, there would be no jobs created associated with the CD-IV Project and therefore no effects on socioeconomic resources. Under this alternative, job creation from the construction of the pipelines and power plant would not take place and the demand for temporary rental housing would not occur.

However, exploratory well construction in Basalt Canyon could continue, not as part of the CD-IV Project, but under prior approvals. These activities would result in some beneficial impacts to socioeconomics as a result of jobs created and increased demand for temporary rental housing by the construction of additional wells, but less than those created by the Proposed Action.

4.15.7.2 CEQA Significance Determination

Under Alternative 4, there would be no adverse impact in regard to CEQA criteria a), b), or c), although the potential beneficial effects of the Proposed Action would not occur.

4.15.8 Cumulative Impacts

The potential for cumulative socioeconomic impacts exists where there are multiple projects proposed in an area that have overlapping construction schedules and/or project operations that could affect similar resources. Projects with overlapping construction schedules and/or operations could collectively result in a demand for labor that cannot be met by the region's labor pool, which could lead to an influx of non-local workers and possibly their dependents. This population increase could impact social and economic resources if there are insufficient housing resources and/or infrastructure and public services to accommodate the new residents' needs.

4.15.8.1 Geographic Extent/Context

The Proposed Action is immediately northeast of U.S. Highway 395 and SR 203, and would be the fourth power plant within a complex that already includes three geothermal power generating facilities. The CD-IV Geothermal Complex is across U.S. Highway 395 and approximately 2 miles east of the Town of Mammoth Lakes. As was described in Section 3.15, the local community experiencing the most immediate socioeconomic impacts from the CD-IV Project would be the Town of Mammoth Lakes, although other socioeconomic effects could ripple throughout the entire regional economy, defined as Mono County.

4.15.8.2 Existing Cumulative Conditions

As was described in Section 3.15, the largest economic driver of growth in Mono County has been the ski industry and the resort-based second-home community focused on the Town of Mammoth Lakes. In addition, past development of geothermal power generation capacity in the Project area has had an incremental effect on the population size and composition, settlement patterns, housing demand, and business revenues in Mammoth Lakes and throughout Mono County. As the population increases through direct and indirect influences of development, housing demand increases and the workforce expands. In addition, continued development creates more infrastructure affecting business operations, revenues, and economic growth in the region. Section 3.15 described the existing socioeconomic conditions within the region of influence, including demographics, housing characteristics, and laborforce characteristics, which have developed as a result of the past and present projects that comprise existing cumulative conditions.

These past and existing projects would contribute to the cumulative impact of the Proposed Action and Alternatives. These types of past and existing projects, together with the reasonably foreseeable projects described below, could combine with impacts of the Proposed Action or an alternative to affect socioeconomics within the geographic extent of this cumulative analysis.

4.15.8.3 Reasonably Foreseeable Projects

Table 4.1-1 provides a listing of current and reasonably foreseeable projects, including other proposed or approved geothermal energy projects in the project area. Most of the other projects listed are urban development or redevelopment projects associated with the Town of Mammoth Lakes, and are part of the routine upkeep of municipal streets, parks, and infrastructure. A new terminal for the Mammoth Yosemite Airport, owned and operated by the Town of Mammoth Lakes, Mono County's only airport with commercial service, is also planned south of the CD-IV Project along U.S. Highway 395. A few of the listings, such as the Sierra Star Master Plan Project, are large land development proposals that were planned before the real estate collapse that began in 2008, and may or may not move forward in the foreseeable future in the same form. The larger projects presented in Table 4.1-1 have either undergone independent environmental review pursuant to NEPA and/or CEQA or would do so prior to approval. Even if environmental review has not yet been completed for projects determined to be located within the geographic extent of this cumulative analysis, the potential effects of all projects comprising the existing and reasonably foreseeable cumulative conditions relevant to the CD-IV Project were considered in the cumulative impacts analyses in this EIS/EIR. Of the cumulative projects listed in Table 4.1-1, the following list provides a summary of the most relevant projects which characterize the reasonably foreseeable projects affecting socioeconomic conditions:

1. ***Mammoth Pacific I Replacement Project.*** ORNI 50, LLC proposes to replace the aging MP-I power plant on about 5.7 acres of land located between the existing MP-I and MP-II plant sites. The new M-I power generation facilities would replace the existing MP-I power generation facilities and the existing MP-I power generation facilities would be dismantled and removed. Project operations would result in increased generation of electricity and lower fugitive emissions of motive fluid, isobutene from plant equipment.

2. ***Mammoth Pacific II Project.*** Existing 15 MW geothermal electric generating facility and production and injection well field. Located approximately 1,200 feet northeast of the MP-I plant on land referred to as “G2,” the MP-II project has been operating since 1990. The two projects have been integrated by MPLP and geothermal fluid discharged from either of the plants can be injected into any of the available injection wells.

3. ***PLES-I Project.*** This existing 15 MW PLES-I project includes a geothermal electric generating facility and is located immediately south of the MP-II project power plant. The plant site is also referred to as “G3.”

Some possible cumulative effects include but are not limited to: increased temporary employment during construction, increased permanent employment during operation and maintenance, alteration of business revenues, need for construction or expansion of public services and infrastructure.

While Mono County is projected to continue to increase in population, requiring additional housing, public services, and utilities over time, the anticipated growth rates are not extraordinary, and a substantial surplus of housing of all types currently exists in both the Town of Mammoth Lakes and Mono County as a whole.

4.15.8.4 Construction

Construction of the Proposed Action would utilize the same workforce skills as the MP-I Replacement Project described above. This project is under the control of ORNI 50, LLC, however, and it is reasonable to expect that its development would be coordinated with the Proposed Action. There may also be some construction skill types that would be relevant to both the Proposed Action and other projects planned in the area, such as construction of a new airport terminal. However, many of the skilled craft trades required for construction of a geothermal power plant, pipelines, and wells would be different from the majority of the streets and roads construction projects ongoing within the Town of Mammoth Lakes.

Due to the large surplus of housing currently available in Mono County (more than 7,000 units potentially available for rent at this time), it is highly unlikely that the cumulative impacts of all of the planned and proposed construction projects combined would have a noticeable impact on displacement or growth inducement in housing markets, or on the character of the residential communities in Mono County. Therefore, no major adverse cumulative impacts would be expected to result.

Similarly, with approximately 800 members of the Mono County workforce currently unemployed and looking for work, there is capacity within the county labor pool to quickly fill the job needs if skill sets are compatible. Most likely, however, for the specialized construction trades required for the major projects listed in Table 4.1-1, some temporary workers would be attracted into the local economy. Simultaneous development of multiple projects from the list in Table 4.1-1 could have a beneficial, although small, impact on the Mono County economy and on public revenues to local jurisdictions, and could have a small adverse impact on existing residents of rental housing due to an increase in demand for and prices of rental housing. However, this effect would likely be negligible due to the existing excess of available rental housing.

4.15.8.5 Operation and Maintenance

The Proposed Action would be the addition of a fourth geothermal power generation plant to a complex that already contains three existing geothermal plants. All four facilities would be operated by the same workforce, and that workforce would need to be expanded by an estimated six additional workers to handle the fourth power plant. The proposed new terminal for the Mammoth Yosemite Airport would be larger than the existing facilities and may require the addition of a few more employees. Other projects planned as listed in Table 4.1-1 would also likely need a few more people for their ongoing operations once they are built and in place. Given that the Town of Mammoth Lakes and Mono County have a large inventory of available housing, however, it is unlikely that there would be any significant displacement or impact on housing markets or community character due to the cumulative operation of any or all of the planned and proposed projects combined.

The expanded employment opportunities, although very small in number, would be perceived as beneficial to the local and regional economy, and on the margin would generate minor new ongoing revenues to the Town of Mammoth Lakes and to Mono County. Operation of the geothermal power generation facilities would also produce revenue for Mono County through the revenue-sharing agreements with the federal and state governments.

4.15.8.6 Decommissioning

Upon permanent closure of the Proposed Action, the beneficial socioeconomic contributions to the cumulative economic conditions of the region would no longer occur. It is assumed that many of the same impacts that occurred during construction activities would occur during decommissioning, and the CD-IV Project’s decommissioning contribution to these cumulative impacts would be approximately the same as described above for construction.

4.15.8.7 CEQA Significance Determinations

The CEQA issues identified in the Significance Criteria presented in Section 3.15.2.2 are essentially the same as those analyzed above in the NEPA discussion, especially the analysis of impacts on housing markets and community character. Given the ability of Mono County to easily house more temporary or permanent population, and the relatively small size of the projects currently planned and proposed in Mono County in terms of labor force needs, it is unlikely there would be any significant adverse cumulative impacts during any of the project phases: construction, operation and maintenance, or decommissioning, for either the Proposed Action or any of the alternatives.

4.15.9 Mitigation Measures

None recommended.

4.15.10 Residual Impacts after Mitigation Incorporated

Not applicable.

4.16 Traffic, Transportation, and Circulation

4.16.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts to traffic, transportation, and circulation. Impacts are identified and evaluated based on consistency with adopted transportation plans and policies. Effects on traffic flow (i.e., increases in delay experienced by motorists) may occur from physical changes to public roads, construction activities, introduction of construction- or operations-related traffic on local public roads, or changes in traffic volumes created by workforce changes in the area. This section does not include the evaluation of the Project's impacts on low-volume roadways owned and/or maintained by the USFS, or on access provided to recreational users of such roadways. Effects related to recreational use of NFSRs and facilities operated and maintained by the USFS are addressed in Section 4.14, *Recreation*.

4.16.1.1 Increased Traffic on Regional and Local Roads

The following includes a description of activities associated with the construction, operation and maintenance, and decommissioning of the CD-IV Project, and describes the anticipated increase in traffic along regional and local roadways due to such activities.

Description of Construction Activities

CD-IV Project traffic generation was determined for construction, O&M, and decommissioning phases based on the intensity of project-related activities at the project sites. Construction of the proposed power plant is expected to require approximately 16 months and would be divided into two sequential phases, with Phase I occurring over an eight-month period, and Phase II occurring over the next eight months. Phase I would include construction of power plant components and main pipeline, and up to six well pads (weather permitting). Phase II would include the continue construction of the remaining power plant components and the remaining planned pipelines and well pads. Construction of the power plant would be concurrent with the construction of the planned well pads and pipeline installations. Construction of the well pads would require a total of approximately 12 months, and would require approximately 60 days to complete each well site. Well pad construction would be phased during two summer seasons, six months per phase; however, weather-permitting, up to two well pads could be constructed during a third summer season. Construction of the geothermal fluid production and injection pipelines would require approximately six months (one summer season).

Project construction would be confined within a determined construction corridor such as a new, permanent access road, or adjacent to an existing public roadway, or within a designated site area. Staging of construction vehicles (temporary parking for construction machinery and workers' vehicles) would occur within designated staging areas or within approved easements, with no disruption to public right-of-ways (e.g., U.S. Highway 395, SR 203, Sawmill Road (03S25), etc.). Furthermore, vehicles not in immediate use during construction activities would be parked either on existing facilities (well pads and power plant) or at locations adjacent to existing access roads to allow continued access. Short, permanent access roads would be constructed in areas with no direct access to a project site from an existing roadway; these access roads would be up to 15 feet wide, with a turning radius of no less than 50 feet (see Section 3.16 for list of access roads to each proposed well pad facility and adjacent pipeline route). Vehicle access to any off-road location would be limited to that specifically necessary for construction. No permanent removal of existing public roadways (regional, local) or work within such public right-of-ways would result from construction of the planned well pads and pipelines. A detailed description of NFSRs and the extent to which the CD-IV Project would affect circulation and access along these roads during construction activities is provided in Section 4.14, *Recreation*.

For sections of pipeline that would not be immediately adjacent to an access road, construction equipment would "catwalk" over the top of the existing vegetation without removing it to reduce potential ground disturbances or visual impact. As stated in Chapter 2, Section 2.2.4.3, *Pipeline Access*, catwalking involves using a vehicle with large rubber tires to drive atop the scrub vegetation, which would trample, but not remove, vegetation. No construction vehicles would be allowed to maneuver (turnaround or drive in) any area beyond a 40-foot-wide temporary construction corridor along the pipeline route. In areas where pipelines would cross public right-of-ways, cut-and-fill trenching methods would be applied. Pipeline installation under U.S. Highway 395 would require micro-tunneling methods, and there would be no disturbance to roadway traffic or restricted access to general and emergency vehicles.

Construction Traffic

The anticipated construction-related activities that would contribute to traffic at the project sites during construction include, but are not limited to, the following:

1. Clearing brush and grading for construction of temporary, short access roads
2. Clearing vegetation, earthwork, drainage, grading, and laying gravel for construction of well pads, power plant, and substation
3. Blading and clearing of vegetation for development of construction corridor along pipeline alignments
4. Grading for construction of turnout areas for vehicles
5. Transporting machinery and equipment for drilling operations
6. Transporting of welded-steel pipelines
7. Transporting (import) of fill materials and revegetation materials
8. Transporting (export) of excavated materials, debris, and spoils
9. Miscellaneous deliveries
10. Fuel delivery

Construction-related worker and haul truck traffic would vary depending on scheduling and phasing of construction activities. Table 4.16-1 summarizes the number of worker vehicles and construction trucks required by activity during the entire construction period.

TABLE 4.16-1
ESTIMATED MAXIMUM DAILY VEHICLE TRIPS FOR PROJECT CONSTRUCTION

Construction Activity[a]	Daily Vehicle Trips[b]	One-Way Trips
Well Pads		
Haul Trucks	44	88
Workers	38	76
Subtotal	*82*	*164*
Power Plant[c]		
Haul Trucks	15	30
Workers	100	200
Subtotal	*115*	*230*
Pipeline Installation[c]		
Haul Trucks	5	10
Workers	75	150
Subtotal	*80*	*160*
Total Trips		
Haul Trucks	64	128
Workers	213	426
Total Daily Vehicle Trips	***277***	***554***

NOTES:
a Haul truck and worker data provided by ORNI 50, LLC, as presented in Chapter 2, *Proposed Action and Alternatives*.
b Worker trips include total commute round trips per day x 1.25, to account for miscellaneous midday trips.
c Vehicle trips associated with power plant and pipeline construction only apply to Phase I of construction; the maximum daily trips for Phase II would be the same.

Well pad construction and drilling would require approximately 25 to 40 haul trucks for the initial delivery of machinery and equipment (e.g., diesel generators, fuel, air compressors) to the project sites. Construction and drilling of the well facilities would be conducted all day (24 hours a day), with crews working in two shifts per day. Crew size for well construction and drilling would require between 12 and 15 workers per shift. Two well facilities could be constructed concurrently, thus requiring a total of two crews (up to 30 workers per shift). Based on these estimates, the construction and drilling of the well facilities would generate up to 44 haul trucks, and accounting for worker commute trips and miscellaneous midday trips, approximately 38 worker vehicles would travel to and from the well sites per day. Therefore, construction and drilling of the well facilities would generate approximately 82 vehicle round trips (164 one-way trips) per day.

Power plant construction (for each phase of construction) would require an average of approximately 10 haul trucks for delivery of materials per day, and up to 15 haul trucks per day during peak construction periods. Construction of the power plant would be conducted on weekdays (6:00 a.m. to 6:00 p.m.), and no nighttime activities would occur. Construction would require up to 80 workers onsite per day. Based on these estimates, the construction of the power plant would generate up to 15 haul trucks, and accounting for worker commute trips and miscellaneous midday trips, about 100 worker vehicles would travel to and from the power plant site per day. As a result, construction of the power plant would generate approximately 115 vehicle round trips (230 one-way trips) per day for each phase of construction.

The construction and installation of geothermal, production and injection pipelines during only Phase I of construction would require up to 5 haul trucks to travel to and from the project sites during a typical workday. Construction and installation activities would also require approximately 40 to 60 workers per day. Activities would occur on weekdays (6:00 a.m. to 6:00 p.m.), and no nighttime activities would occur. Based on these estimates, the construction and installation would generate up to 5 haul trucks, and accounting for worker commute trips and miscellaneous midday trips, approximately 75 worker vehicles would travel to and from the work sites per day. As a result, construction and installation of the pipelines would generate approximately 80 vehicle round trips (160 one-way trips) per day.

Construction Vehicle Trip Distribution

It is anticipated that the majority (about 70 percent) of the construction workforce for the CD-IV Project would be drawn from out of the project area and would require housing in local hotels or rental apartments and houses in nearby communities (e.g., Mammoth Lakes, Bishop). About 30 percent of the construction workforce is expected to reside in local towns and cities near the Project area.

Operations and Maintenance

After construction of the CD-IV Project is completed, these facilities would not require any haul trucks or construction vehicles. An additional six new employees would be added to the current workforce at the existing geothermal facilities to perform operations and maintenance activities for the new facilities. Routine maintenance activities would include regular plowing of roadways during the winter season to maintain access to the power plant and production wells; however, injection wells would not require winter plowing. As a result, once the facilities are fully operational, approximately six new vehicle trips would be generated (up to 12 one-way trips) per day.

Decommissioning

As discussed in Section 2.2.8, *Project Decommissioning*, the proposed power plant would be in operation over a 30-year period. At the end of this period, the CD-IV Project would cease operation, and at that time all facilities would be decommissioned and dismantled, and the site and all new access roads, no longer needed, would be restored to pre-existing conditions (see **Mitigation Measure TRA-1**, Section 4.16.9).

Decommissioning of the site would include removal of all equipment and buildings on-site (e.g., power plant, well pads, and geothermal wells), as well as excavation to remove underground facilities (e.g., well heads). The workforce required during these activities would be similar to construction activities, as described above. As such, decommissioning activities would result in a maximum of 64 daily haul truck trips, up to 213 daily worker trips, and would require approximately 12 months to complete.

4.16.1.2 Emergency Access

Construction along affected public roadways could result in impaired access to other NFSRs, and subsequently to existing recreational areas (e.g., campground, information centers), trails, multi-use paths, and other existing buildings for both general and emergency vehicles in the vicinity of the work sites (see Section 4.14, *Recreation*, for additional information regarding access to recreational uses for emergency vehicles). This disruption could be particularly problematic for emergency service providers (e.g., police and fire).

4.16.1.3 Traffic Safety

Implementation of the proposed CD-IV Project and its facilities would involve work adjacent to existing public roadways, with potential traffic safety hazards due to conflicts where construction vehicles access a public right-of-way from the project area; or increased truck traffic in general (and their slower speeds and wider turning radii) during construction. Traffic safety hazards could also occur where delivery and haul trucks share the roadway with other vehicles, bicyclists, and pedestrians.

4.16.1.4 Alternatives Modes of Transportation

As discussed in Section 3.16.1, *Environmental Setting*, there are transit routes, bicycle facilities (shared road bicycle routes, and paths), and pedestrian paths and trails that operate on, or are located along, roadways, or are adjacent to the planned CD-IV Project facilities. The increase in construction-, operation-, and decommission-related traffic and presence of haul trucks along adjacent roadways could potentially disrupt transit service as well as potentially conflict with, or result in impaired access to users of, existing bicycle and pedestrian facilities.

4.16.2 Project Design Measures

The analysis assumes that the following PDMs related to traffic, transportation and circulation are fully implemented:

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

3. *TR-3*: 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.

4. *TR-4*: 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.

5. *TR-5*: 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 which will eliminate Ormat's need to plow Sawmill Road (03S25) in the winter. This plan will provide the majority of the winter access for the new well pads proposed for the CD-IV Project.

6. *TR-6*: 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 (NFSR 03S08) and on other unimproved roads in the project area.

4.16.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to hazards and hazardous materials if it would:

a) Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit, non-motorized travel, and relevant components of the circulation system (including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit);

b) Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in locations that results in substantial safety risks;

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);

e) Result in inadequate emergency access; or

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

4.16.4 Alternative 1: Proposed Action

4.16.4.1 Direct and Indirect Impacts

Increased Traffic on Regional and Local Public Roadways

Construction

Construction of each project component would result in short-term (up to 16 months) increases in the above-described vehicle trips on area roadways. The number of construction-related vehicle trips would vary each day, depending on the type of project component, construction phase, planned activity, and material needs. As such, the actual impact of construction vehicle traffic on local and regional public roadways would vary by the time of day, the number and type of construction-related vehicles, the number of travel lanes on the affected roadways, and the existing traffic volumes on the roadways. Impacts of construction traffic would be most noticeable on roadways in the immediate vicinity of the project work sites (e.g., NFSRs and local public roads that provide access to NFSRs) and less noticeable on roadways farther away from the sites (as project trips disperse over the road network) and on higher-volume regional roadways (e.g., U.S. Highway 395 and SR 203). Furthermore, because construction of the facilities would occur simultaneously within each phase of the project, construction activities could cause a compounded increase in traffic volumes, worsening traffic conditions along affected public roadways.

Based on the estimated amount of traffic generated by the proposed action, concurrent construction activities would result in as many as 213 worker trips and 64 haul truck trips on a daily basis, resulting in up to 554 one-way trips per day (primarily during the daytime hours). Generally, worker trips to and from the work sites would occur outside typical peak commute periods (i.e., commute trips prior to the a.m. peak traffic hours [7:00 a.m. to 9:00 a.m.] and after the p.m. peak hours [4:00 p.m. and 6:00 p.m.], with possible miscellaneous midday trips). Haul truck trips would be spread over the course of the day. Based on the fact that the well pads and pipeline alignments are not all located proximate to each other, and on the reasonable expectation that the workers' residences would be spread among nearby cities and towns, and project trips would be dispersed on different roads, the estimated daily vehicle trips associated with concurrent construction activities would represent between 8 and 14 percent of existing traffic volumes on regional roads (e.g., U.S. Highway 395 and SR 203). While more noticeable on two-lane local County-maintained roads (e.g., Antelope Springs Road and Sawmill Road (03S25)), the increased traffic volumes would remain at levels less than the carrying capacity of those roads (which is about 10,000 to 15,000 vehicles per day). In addition, no roadway or lane closures along regional or County-maintained roadways would occur (as stated in the above-mentioned PDMs, see Section 4.16.2).

As described in Section 3.16.1.2, *CD-IV Access*, construction vehicles would be required to use existing NFSRs to access the work sites. These roadways consist of paved and unpaved, one- and two-lane, curvilinear and sloping facilities that provide vehicular access and non-vehicular (bicycle, pedestrian) access to multiple scenic locations and recreational areas (picnic areas, campgrounds, information centers, etc.). As stated at the start of this section, the analysis of potential environmental consequences of the Proposed Action and Alternatives in this section focuses on the possible impacts to traffic flow (i.e., increases in delay experienced by motorists) caused by the Project, and not impacts on low-volume roadways owned and/or maintained by the USFS, or on access provided to recreational users of such roadways. Traffic volumes on the affected NFSRs are low enough that the Project would have no material effect on traffic flow on those roads. A detailed description of NFSRs and the extent to which the CD-IV Project would affect access along NFSRs during construction activities is provided in Section 4.14, *Recreation*.

As noted in the PDMs (see Section 4.16.2), ORNI 50, LLC would minimize any restrictions to vehicular access along County-maintained, public roadways during construction activities, and would apply appropriate measures to ensure traffic flow along affected roadways during construction. Furthermore, ORNI 50, LLC would perform traffic control measures to provide appropriate travel route information for construction materials, construction workers, and also identify the process for complying with any State requirements and obtaining necessary permits. Traffic control measures would also be expected to reduce any potential adverse effects to the local and regional circulation system because these control measures would reduce construction-related traffic impacts on the roadways at, and near the work sites, reduce potential traffic safety hazards, and ensure adequate access for emergency responders. Because the construction of the CD-IV Project and its facilities would include these aforementioned measures, the increase in traffic from the CD-IV Project would not result in any adverse effects to the public roadways.

Operation and Maintenance

After construction of the CD-IV Project is completed, these facilities would not require any haul trucks or construction vehicles. As stated, existing personnel and about six new employees would be required to perform operations and maintenance activities of the new facilities. Routine maintenance activities would include regular plowing of roadways during the winter season to maintain access to the power plant and production wells; however, injection wells would not require winter plowing.

As a result, once the facilities are fully operational, approximately six new vehicle trips would be generated (up to 12 one-way trips). This marginal increase in vehicle trips during long-term operations would be negligible compared with existing traffic conditions. Therefore, the increase in traffic on surrounding public roadways from the CD-IV Project during operation and maintenance activities would not result in any adverse impacts to the existing network.

Decommissioning

Decommissioning activities and the number of workers and trucks required during such activities of the CD-IV Project and its components would be similar to the peak construction activities, as described above, and the increased traffic during decommissioning would have a similar effect on traffic conditions as during construction. Therefore, as discussed under construction activities, implementation of the PDMs during decommissioning of the CD-IV Project would result in no adverse effects to the existing network.

Emergency Access

Construction and Decommissioning

Construction and decommission activities would occur adjacent to existing public roadways and although no temporary lane closures are anticipated along public roadways, the potential of such temporary (up to 16 months) closures along these roads could result in impaired access to existing buildings and other recreational areas for both general and emergency vehicles in the vicinity of the work sites. Furthermore, SR 203 is designated as an evacuation route for the Town of Mammoth Lakes. Disruption to traffic flow on this roadway during construction and decommission activities could result in an adverse impact to emergency access. The PDMs listed above (i.e., TR-2 and TR-3) would ensure that access along public roadways for general and emergency vehicles would be maintained at all times by prohibiting vehicles from blocking roadways. Therefore, the CD-IV Project would result in no adverse effects to emergency access.

Operation and Maintenance

Once construction of the CD-IV Project is completed, existing public roadways and USFS routes would provide permanent access. Internal access roads would be used during operation and maintenance activities; these access roads would be approximately 15 feet wide, and would consist of unpaved, compacted road base.

Existing public roadways, ancillary NFSRs, and a series of access roads would be provided at the various project sites, and implementation of PDMs would maintain access along public roadways during all seasons. 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 applied as appropriate (See Appendix B, USFS, 2012). Additionally, PDM TR-5 states that during operation and maintenance of the project, access along public roadways and recreational facilities would be maintained through snow plowing. Based on these findings, the CD-IV Project would result in no adverse effects to emergency access during operation and maintenance activities.

Traffic Safety

Construction and Decommissioning

As described above, the percent increase in daily traffic volumes resulting from construction traffic generated by the CD-IV Project and decommissioning activities would not be substantial relative to the background traffic volumes on regional and local public roadways used to access various project sites; however, project traffic could temporarily (up to 16 months) disrupt traffic flows on these roadways and noticeably exacerbate conditions along narrow public roads (e.g., Sawmill Road (03S25), Sawmill Cutoff Road (NFSR 03S08), Antelope Springs Road (03S05)). Potential conflicts between construction- and decommission-related traffic and all other travel modes along affected roadways are considered adverse effects.

Implementation of PDMs, above**,** and the application of appropriate traffic control measures would minimize potential adverse traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways due to construction- and decommission-related activities and vehicle trips, and would reduce any adverse effects related to temporary conflicts with traffic safety hazards.

Operation and Maintenance

The CD-IV Project and its facilities would not result in an increase in hazards once built and operational. The minimal amount of traffic associated with operation and maintenance activities at the various sites would not be substantial relative to background traffic volumes on public roads used to access project facilities, and would not result in any adverse traffic hazards on adjacent public roadways. Therefore, the CD-IV Project would not result in any adverse effects to traffic hazards during operation and maintenance activities.

Alternative Modes of Transportation

Construction and Decommissioning

As described in Section 3.16.1.3, *Public Transportation within the Vicinity of the CD-IV Project,* alternative transportation facilities located within the project area include bus transit service, bicycle paths, bicycle lanes, and pedestrian multi-use trails and paths.

The increases in traffic volumes generated by construction and decommission activities, and the presence of haul trucks along SR 203, could potentially disrupt transit service or cause the slowing of buses on Eastern Sierra Transit Authority routes, as well as potentially conflict with cyclists along the existing Class III bicycle route along the roadway. In addition, the influx in traffic along Sawmill Cutoff Road (NFSR 03S08) could restrict access to other facilities for cyclists traveling along the existing Class I bicycle path and could restrict access to the existing campground area east of Sawmill Cutoff Road (NFSR 03S08). Potential adverse effects to bicycle and pedestrian access along NFSRs by the CD-IV Project are discussed in Section 4.14, *Recreation*.

However, construction and decommission of the CD-IV Project would not permanently eliminate or modify alternative transportation corridors or facilities. In addition, such activities associated with the planned facilities would not include changes in policies or programs that support alternative transportation. Implementation of the PDMs (listed above) would reduce any adverse effects related to temporary (up to 16 months) conflicts regarding impaired access to alternative transportation facilities and temporary reduction in performance and safety of such facilities.

Operation and Maintenance

As stated under construction activities, the CD-IV Project and its facilities would not permanently eliminate or modify alternative transportation corridors or facilities, nor would the CD-IV Project result in any adverse effects related to policies or programs that support such facilities.

4.16.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the project (construction, operation and maintenance, decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.2.2.

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

Construction and Decommissioning

As discussed above, construction and decommissioning of each project component would result in short-term (up to 16 months) increases in vehicle trips on area roadways. The number of construction- and decommission-related vehicle trips would vary each day, depending on the type of project component, construction phase, planned activity, and material needs. The actual impact of vehicle traffic on local and regional public roadways would vary by the time of day, the number and type of construction- and decommission-related vehicles, the number of travel lanes on the affected roadways, and the existing traffic volumes on these public roadways. Impacts of construction and decommission traffic would be most noticeable on public roadways in the immediate vicinity of the project work sites (e.g., Antelope Springs Road and Sawmill Road (03S25)) and less noticeable on roadways farther away from the sites (as project trips disperse over the road network) and on higher-volume regional roadways (e.g., U.S. Highway 395 and SR 203).

Based on the estimated amount of traffic generated by the CD-IV Project, the estimated daily vehicle trips associated with concurrent construction and decommission activities would represent between 8 and 14 percent of existing traffic volumes on regional roads (e.g., U.S. Highway 395 and SR 203). While more noticeable on two-lane local public roadways, the increased traffic volumes would remain at levels less than the carrying capacity of those roads (which is about 10,000 to 15,000 vehicles per day).

Because the construction of the CD-IV Project would include PDMs that address the need to maintain access and traffic flow, and implement traffic control measures during construction and decommission activities, these measures would reduce this impact related to temporary conflicts with established policies regarding transportation system performance to a less-than-significant level.

Operation and Maintenance

As described above, increases in traffic associated with the operations and maintenance activities would not be substantial relative to existing conditions, and the CD-IV Project would not adversely affect traffic conditions over the course of a workday. In addition, these activities would not result in the permanent closure of public roads or travel lanes. Lastly, the minimal amount of traffic generated by the CD-IV Project would not interrupt, interfere with, or limit access to any transit, bicycle, and pedestrian facilities in proximity to the site. This impact would be less than significant.

b) *Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.*

The level of service (LOS) standards established by the Mono County Local Transportation Commission (the congestion management agency) and documented congestion management plan (CMP) are intended to regulate long-term traffic impacts due to future development and do not apply to temporary construction projects. The CD-IV Project would require periodic operations evaluation and maintenance, similar to existing facilities, and operations would result in up to six additional daily vehicle trips over an extended period of time. Because the CD-IV Project would not result in long-term impacts on the roadways used to access the work sites, consideration of

LOS impacts on CMP roadways or local roadways during operation of the project components is not applicable [note, however, that criterion a) above, addresses short-term (up to 16 months) effects on service levels (traffic congestion) related to roadway capacity during project construction]. Therefore, impacts related to applicable CMP standards would be less than significant.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks.

The nearest airport to the Project site is Mammoth Yosemite Airport, located approximately 4 miles east of the site. The CD-IV Project would not change air traffic patterns, increase air traffic levels, or result in a change in location that would result in substantial safety risks. Therefore, the construction, operation, maintenance, and decommissioning of the CD-IV Project or any of the Alternatives would cause no impact related to this criterion.

d) Substantially increase hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment).

Construction and Decommissioning

As discussed above, the CD-IV Project would not change the roadway network, but truck trips associated with the construction and decommissioning of the proposed facilities on the CD-IV Project site would temporarily change the mix of vehicle types on area roads. During construction, there would be work that would occur adjacent to existing public roadways. Traffic safety hazards could occur due to: (1) conflicts where construction vehicles access a public right-of-way from the Project area; (2) conflicts where road width is narrowed; or (3) increased truck traffic in general (and their slower speeds and wider turning radii) during construction and decommissioning.

As described with respect to CEQA significance criterion a), above, the increase in traffic volumes resulting from construction and decommissioning-related traffic generated by the CD-IV Project would not be substantial relative to the background traffic volumes on public roads used to access NFSRs and the various work sites. However, impacts associated with the potential conflicts between Project-related traffic and all other travel modes would be considered potentially significant. Implementation of PDMs, through the application of appropriate traffic control measures and maintaining access to public roadways during temporary construction and decommissioning activities, would minimize potential adverse traffic safety hazards on adjacent public roadways due to Project-related activities and vehicle trips, and would reduce this potential impact to a less-than-significant level. For discussion of construction and decommission activities and potential adverse effects to NFSRs, see Section 4.14, *Recreation*.

Operation and Maintenance

The CD-IV Project and its facilities would not result in an increase in hazards due to a design feature once built and operational. The minimal amount of traffic associated with operation and maintenance activities at the project site would not be substantial relative to background traffic volumes on public roads used to access the site, and would not result in any adverse traffic hazards on adjacent public roadways. Therefore, impacts to traffic hazards during operation and maintenance activities would be less than significant.

e) Result in inadequate emergency access.

Construction and Decommissioning

Construction and decommissioning activities would occur along specific corridors and easements, with no lane closures along public roadways. Drivers of vehicles traveling behind a slow-moving heavy truck would be slowed, but rules of the road dictate that emergency vehicles have the right-of-way, and Project-related activities would not substantially impair emergency access. In addition, in order to maintain the integrity of roads and minimize erosion, access roads for production wells would be constructed using a durable road surface (aggregate, road base or paving). 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. (see Section 2.2.4.4). Therefore, with implementation of PDMs and appropriate traffic control measures, this impact would be less than significant.

Operation and Maintenance

As discussed above, once construction of the CD-IV Project is completed, existing public roadways, NFSRs, and a series of access roads would be provided at the various sites, and these roadways would accommodate both general and emergency vehicles. Furthermore, the application of the "Snow Removal and Storage" BMP and the need to plow snow to maintain access to all production wells during the winter season (see Section 2.2.4.4), would also reduce any impacts related to emergency access (See Appendix B for Snow Removal and Storage BMPs). As a result, the implementation of PDMs and the need for continued access to the project site would reduce any impacts to a less-than-significant level.

f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Construction and Decommissioning

As discussed above, construction of the CD-IV Project would not permanently eliminate or modify alternative transportation corridors or facilities, nor would construction and decommissioning activities include changes in policies or programs that support alternative transportation. Furthermore, implementation of PDMs and the use of traffic control measures to maintain access and traffic flow along public roadways, would reduce potential impacts related to temporary (up to 16 months) conflicts regarding impaired access to alternative transportation facilities and temporary reduction in performance and safety of such facilities to a less-than-significant level.

Operation and Maintenance

The CD-IV Project during operation and maintenance activities would not reduce, disrupt, or eliminate access to existing bicycle and pedestrian facilities. As a result, the effect on alternative transportation facilities due to these activities of the CD-IV Project would be less than significant.

4.16.5 Alternative 2: Plant Site Alternative

4.16.5.1 Direct and Indirect Impacts

Increased Traffic on Regional and Local Public Roads

Potential impacts related to the increase in traffic on public roadways during construction, operation and maintenance, and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects to the regional and local circulation network.

Emergency Access

Potential impacts related to emergency access during construction, operation and maintenance, and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects related to access for emergency and general vehicles.

Traffic Safety

Potential impacts related to traffic safety during construction, operation and maintenance, and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects to hazards on adjacent roadways.

Alternative Modes of Transportation

Potential impacts related to alternative modes of transportation (including transit, bicycle, and pedestrian facilities) during construction, operation and maintenance, and decommissioning of Alternative 2 would be the same as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects to these facilities and users of such facilities.

4.16.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 2 would be less than significant.

4.16.6 Alternative 3: Modified Pipeline Alternative

4.16.6.1 Direct and Indirect Impacts

Increased Traffic on Regional and Local Public Roads

Potential impacts related to the increase in traffic on public roadways during construction, operation and maintenance, and decommissioning of Alternative 3 would be the same as described for the Proposed Action, as Alternative 3 would include the same components; however would emplace a small number of planned pipelines (production and injection pipelines) and well pads in different locations, than proposed under the Proposed Action (see Section 2.4.3.1 in Chapter 2). Alternative 3 would require the same amount of workers, vehicles, and haul trucks. Therefore, implementation of the PDMs would continue to be required under Alternative 3, and would reduce any adverse effects to the regional and local circulation network.

Emergency Access

Potential impacts related to emergency access during construction, operation and maintenance, and decommissioning of Alternative 3 would be similar as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects related to access for emergency and general vehicles.

Traffic Safety

Potential impacts related to traffic safety during construction, operation and maintenance, and decommissioning of Alternative 3 would be similar as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects to hazards on adjacent roadways.

Alternative Modes of Transportation

Potential impacts related to alternative modes of transportation (including transit, bicycle, and pedestrian facilities) during construction, operation and maintenance, and decommissioning of Alternative 3 would be similar as described for the Proposed Action. Implementation of the PDMs would reduce any adverse effects to these facilities and users of such facilities.

4.16.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 3 would remain less than significant.

4.16.7 Alternative 4: No Action

4.16.7.1 Direct and Indirect Impacts

Increased Traffic on Regional and Local Public Roads

The No Action Alternative would not include construction, operation and maintenance, and decommissioning of the CD-IV project pipelines, wells and power plant. Therefore there would be no impacts on traffic and transportation.

However, up to 11 geothermal exploratory wells could be constructed in the Basalt Canyon area, which have been approved previously. Although not part of the CD-IV project, traffic impacts related to well construction would be similar to the Proposed Action. Comparatively, these well exploration activities would generate much less traffic along existing public roadways compared with the Proposed Action and consequently would not result in any impacts to the local and regional circulation network.

Emergency Access

Except for negligible amounts of traffic associated with exploratory well development approved previously, vehicular access throughout the area under the No Action Alternative would be similar to existing conditions. Therefore, the No Action Alternative would result in no adverse effects to access for emergency and general vehicles.

Traffic Safety

Except for negligible amounts of traffic associated with exploratory well development approved previously, traffic conditions under the No Action Alternative would be similar to existing conditions. Therefore, the No Action Alternative would not result in any adverse effects to hazards on adjacent roadways.

Alternative Modes of Transportation

Except for negligible amounts of traffic associated with exploratory well development approved previously, traffic conditions under the No Action Alternative would be similar to existing conditions. Therefore the No Action Alternative would not result in any adverse effects to existing transit, bicycle, and pedestrian facilities or users therein, nor would the alternative conflict with any policies or programs that support such facilities.

4.16.7.2 CEQA Significance Determination

The No Action Alternative would generally result in no impacts to transportation and circulation. However, there could be a slight temporary increase in traffic related to development of up to 11 geothermal exploratory wells approved previously compared with existing conditions.

4.16.8 Cumulative Impacts

4.16.8.1 Geographic Extent/Context

For the purposes of the cumulative analysis of transportation and traffic impacts, only those other projects that make or would make a substantial contribution to traffic at the same public roadway segments as the CD-IV Project (e.g., SR 203, U.S. Highway 395, Sawmill Road (03S25), Sawmill Cutoff Road (NFSR 03S08), Old Highway 395) are considered. Because the volume of traffic generated during construction and decommissioning would occur over a short period of time and the increase in traffic from the CD-IV Project would be substantially less during operation and maintenance activities, only segments of SR 203 and U.S. Highway 395 in proximity to the CD-IV Project site would experience any appreciable increase in traffic. Therefore, the geographic scope for cumulative impacts consists of the immediate vicinity of the CD-IV Project sites where other projects might contribute traffic to the same segments of SR 203 and U.S. Highway 395. The temporal scope for cumulative traffic impacts includes the construction, operation and maintenance, and decommissioning phases of the CD-IV Project, because each phase would contribute traffic to roadways within the geographic scope.

4.16.8.2 Existing Cumulative Conditions

For the CD-IV Project, existing cumulative conditions include projects identified in Table 4.1-1, Section 4.1.5, *Cumulative Scenario Approach*. Table 4.1-1 identifies which renewable projects, other BLM authorized actions, and other known actions or activities are located or would occur within the cumulative analysis impacts area. The majority of projects listed in Table 4.1-1 have been, are being, or would be required to undergo their own independent environmental review under NEPA or CEQA or both, as applicable.

Notably, each project listed in Table 4.1-1 would have its own implementation schedule, which may or may not coincide or overlap with the CD-IV Project's schedule. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the CD-IV Project.

4.16.8.3 Reasonably Foreseeable Projects

Development near the CD-IV Project area includes those projects listed in Table 4.1-1. The majority of the projects listed in the table have been implemented, are in the planning phases, or are to be constructed in the future; therefore, traffic associated with most of these projects would contribute to ongoing operational traffic to area roadways during the CD-IV Project's construction, operation and maintenance, and decommissioning phases. More so, traffic associated with past projects are included in existing traffic volumes on the road network and, therefore, is accounted for as part of existing conditions for the CD-IV Project evaluated in Section 4.16.4.1, *Direct and Indirect Impacts*, above. Other foreseeable projects listed in Table 4.1.1 that are in the planning phase or are to be constructed in the future have the potential to affect the regional and local road network, and would generate traffic along the same public roadways as the CD-IV Project.

4.16.8.4 Construction

Cumulative impacts would be greatest if the peak construction period of all of these projects overlapped. Although this worst-case scenario is unlikely, even if it were to occur, it is unlikely that traffic conditions of the affected regional and local public roadways would degrade to unacceptable service levels because roadways near the CD-IV Project have a carrying capacity of about 10,000 to 15,000 vehicles per day (i.e., much more than current traffic volumes). Additionally, Project-generated traffic during any phase would not be substantial enough to degrade conditions along public roadways nor result in the exceedance of existing roadway capacities.

Cumulative impacts to segments of SR 203 and U.S. Highway 395 have been considered because it is likely that construction vehicle trips from foreseeable future projects and the CD-IV Project would have the greatest potential to combine cumulatively on these regional roadways. It is likely that a portion of construction traffic, including worker and haul trucks, for projects currently planned or to be construction in future years would traverse the same portion of SR 203 and U.S. Highway 395 as Project construction-related traffic. For example, the *Digital 395 Middle Mile Project*, as presented in Table 4.1.1, would begin construction in 2012 and would include the construction of a new 583-mile, fiber network that would mainly follow U.S. Highway 395. As such, construction-related traffic associated with the Digital 395 Project could utilize the same regional public roadways as construction vehicles associated with the CD-IV Project; thereby resulting in a compounded increase in traffic along U.S. Highway 395 during a short-term period. However, because there is no indication of when construction would begin for the CD-IV Project, the increase in traffic along U.S. Highway 395 from both the Digital 395 Project and the CD-IV Project may not occur.

Furthermore, although the construction period, workforce, and schedule for the majority of foreseeable future projects are generally unknown, in a worst-case scenario where construction peak periods overlap for all projects proposed in the CD-IV Project area, service levels along these public roadways could be temporarily degraded, but likely would not be degraded below acceptable conditions, and would not result in any permanent degradation. Levels of congestion along these regional roadways could be adversely affected due to the temporary (up to 16 months) influx of construction-related traffic; however, even a worst-case scenario would not likely exceed the capacity of these roadways, which in this area, public roadways have two lanes in both directions to accommodate the anticipated increase in traffic while maintaining adequate traffic flow along the freeway mainline.

The PDMs described in Section 4.16.2, above, would reduce the Project’s construction-related contribution to cumulative traffic impacts. However, because the exact extent of construction traffic overlap cannot be known at this time, it is possible that service levels along these roadways could be temporarily degraded. Therefore, even with implementation of the PDMs during construction of the CD-IV Project, implementation of a coordinated transportation management plan is recommended to reduce the Project’s contribution to any potential traffic impacts to the surrounding network. Therefore, in addition to the established PDMs, implementation of **Mitigation Measure TRA-1** is required to reduce potential cumulative traffic impacts and ensure that adverse cumulative effects would be avoided.

4.16.8.5 Operation and Maintenance

Project operation and maintenance is estimated to generate a net new total of about 12 daily trips, with these trips likely occurring during normal hours of operations (trips arriving during the a.m. peak hour and departing during the p.m. peak hour). Given that roadways near the CD-IV Project have a carrying capacity of about 10,000 to 15,000 vehicles per day (i.e., much more than current traffic volumes), the addition of 12 daily trips during the operation and maintenance phase of the CD-IV Project would be unlikely to contribute substantially to adverse cumulative traffic impacts.

4.16.8.6 Decommissioning

During the closure and decommissioning of the CD-IV Project, the number and proximity of cumulative projects in 30 years (expected life of the power plant and related facilities) is unknown. However, it is reasonable to expect that the analysis of cumulative construction impacts discussed above could also occur during decommissioning, and that **Mitigation Measure TRA-1** implemented during construction activities also would be applicable to decommissioning activities. Consequently, after PDMs (see Section 4.16.2) and implementation of **Mitigation Measure TRA-1**, the CD-IV Project's incremental contribution to any cumulative effect to circulation and traffic during decommissioning would not be substantial.

4.16.8.7 CEQA Significance Determinations

For the reasons described above, with implementation of PDMs and **Mitigation Measure TRA-1** the CD-IV Project's contribution to the cumulative impact to transportation and circulation conditions, in combination with other cumulative projects, would not be substantial and therefore would not be cumulatively considerable.

4.16.9 Mitigation Measures

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 or better 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.

4.16.10 Residual Impacts after Mitigation Incorporated

Following the implementation of PDMs and Mitigation Measure TRA-1, the amount of Project-generated traffic within the area would not exceed thresholds and would not cause or contribute to adverse effects, either individually or cumulatively.

4.17 Utilities and Public Services

4.17.1 Methodology for Analysis

This section describes the conditions related to utilities and public services that would occur during construction, operation and maintenance, and decommissioning of the CD-IV Project and alternatives. The methods for analysis and the CEQA significance criteria are followed by direct and indirect impact discussions and CEQA significance conclusions for the CD-IV Project and alternatives. Cumulative impacts and mitigation measures to reduce any cumulative impacts also are identified.

4.17.1.1 Capacity of Utilities and Public Services

Regarding fire response and police protection matters, this analysis evaluates the CD-IV Project's effects on fire and police agencies' need for new or expanded facilities, the construction of which would result in adverse environmental impacts. Local fire and police department capabilities and performance goals are reviewed and compared to conditions with implementation of the CD-IV Project. Potential effects regarding wildland fire hazards and emergency response or evacuation routes are described in Section 4.13, *Public Health and Safety, Hazardous Materials, and Fire*. Regarding schools and other public facilities, this analysis evaluates the direct and indirect effects of the CD-IV Project on the capacity of these facilities to serve the appropriate populations within the relevant service goals and policies set forth in planning and policy documents. Water demands were evaluated in comparison with the available water supply and historic regional water consumption levels. Projected wastes were evaluated in terms of landfill capacity and compliance with applicable laws, ordinances, regulations, and policies, for both solid wastes and wastewater.

4.17.2 Project Design Measures

The analysis assumes that the following PDMs related to public services and utilities would be fully implemented:

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.

4.17.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to public services or utilities if it would:

a) Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services;

b) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;

c) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;

d) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;

e) Not have sufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements;

f) Result in a determination by the wastewater treatment provider that would or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;

g) Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs; or

h) Not comply with federal, state, and local statutes and regulations related to solid waste.

Potential impacts related to increased demand on existing parks are addressed in Section 4.14, *Recreation*.

4.17.4 Alternative 1: Proposed Action

4.17.4.1 Direct and Indirect Impacts

Capacity of Utilities and Public Services

This analysis of direct and indirect impacts for the Proposed Action is organized according to the following Project phases: construction; operation and maintenance; and decommissioning.

Public Services

Construction

Although Project construction would be temporary, construction-related population increases could occur in the local service area during a period of up to two years, particularly if as described in Section 4.12, *Population and Housing*, construction workers commute weekly to the local service area and make use of temporary housing options. This period could be long enough to affect planning for public service needs. Project construction would result in an increase of up to 120 workers at peak times.

Fire Protection. Although some construction workers are expected to temporarily move into the service area of the local fire protection districts from elsewhere, there are currently enough vacant housing units and hotels to accommodate them without the construction of new housing units. Substantial fire prevention, control, and response measures have been integrated into the CD-IV

Project. These measures are described in Chapter 2, *Proposed Action and Alternatives*, and Section 4.13, *Public Health and Safety, Hazardous Materials, and Fire* and include PDM HAZ-9, which would require ORNI 50, LLC to prepare and implement an Emergency Contingency Plan that would decrease the risk of fires and include fire response measures that employees would implement before emergency responders arrive on-site. The CD-IV Project would not adversely affect the ability of the local fire protection districts serving the Project area to maintain acceptable response times for service to the Project site or result in the need for a new or expanded fire protection facility.

Police Protection. Although some construction workers are anticipated to temporarily move into the service area of the Mammoth Lakes Police Department or the Mono County Sheriff's Department from elsewhere, both could accommodate the small temporary increase in population while maintaining acceptable service ratios.

Schools. Although some construction workers are expected to temporarily move into the local area during construction, typically non-local skilled workers do not bring their families with them for short-term construction assignments. The short duration of the construction period, in combination with the anticipated low numbers of temporary construction workers that would move to the area permanently, would be expected to result in little demand for additional school services as a result of the CD-IV Project.

Operation and Maintenance

The CD-IV Project would result in approximately six full-time personnel workers during operation and maintenance, which is expected to last 30 years. Although operation and maintenance of the CD-IV Project would be long-term, even if all six full-time workers moved into the area from elsewhere this small increase would be expected to have negligible effect on the provision of public services in the CD-IV Project.

Decommissioning

Because decommissioning would require a similar number of workers as the construction phase, it would have a similar effect on the provision of public services in the Project vicinity compared to the construction phase, described above.

Utilities

Construction, Operation and Maintenance

Construction of the CD-IV Project would require up to 25,000 gpd of water for production and injection well drilling. Water requirements for well pad, road, pipeline, power plant, and substation construction, and dust control (all activities other than drilling) would average up to 20,000 gpd. One portable water tank holding at least 10,000 gallons would be maintained in the Project area during construction. Two water trucks would be used to transport water to the site and would also be used to water roads for dust control. Potential water sources for the construction period include:

1. Casa Diablo power plant service water (non-potable shallow ground water 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. MCWD 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. Construction of the CD-IV Project may temporarily increase the demand for potable water at the Project site for use by construction workers. No permanent potable water delivery infrastructure would be installed during operation of the CD-IV Project as new offices or restroom facilities would not be built as part of the Proposed Action.

The CD-IV Project would neither be supported by, nor need to be supported by, a wastewater treatment provider. Construction workers would use portable restroom facilities during construction, which would be maintained by a local contractor. Permanent employees would use existing facilities located in the existing Casa Diablo Geothermal Complex. All geothermal fluid from the proposed power plant would be injected back to the geothermal resource or as authorized by the LRWQCB and the BLM.

The CD-IV Project would implement PDM HYD-5, as discussed in Section 4.19, *Water Resources*, which entails preparation of a site-specific drainage and runoff management plan. This plan would apply to all new roads and would ensure that off-site stormwater would be intercepted in ditches and channeled around well sites. Changes in drainage patterns and increased impervious surface areas at other Project facilities would be mitigated through implementation of Mitigation Measure HYD-A. The preparation of a Comprehensive Drainage Plan under this mitigation would ensure that new stormwater drainage facilities would not result in adverse environmental effects.

Drilling mud and cuttings would be generated from the well drilling operations. These wastes would be temporarily stored in on-site containment basins or tanks. The contents of the containment basin or tanks would be tested and, if inert, and as authorized by the USFS, BLM and the LRWQCB, the materials buried on-site. If burial is not authorized, the inert materials may be removed and used as construction materials on the private lands or disposed of in a waste disposal facility authorized by the LRWQCB to receive and dispose of these materials. Solid waste materials (trash) would be routinely collected and deposited at an authorized landfill by a disposal contractor. The potential for the small amount of waste generated by the CD-IV Project to exceed the available landfill disposal capacity is negligible.

Decommissioning

During decommissioning, the wells would be plugged and abandoned and the pipelines would be recycled or taken to a landfill or other alternative that may exist at the time. The well head (and any other ancillary equipment) would be removed, the casing cut off at least six feet below ground surface, and the well site reclaimed. Typically, aboveground equipment would be dismantled and removed from the site. Some below ground facilities may be abandoned in place. Water use during decommissioning would be less than for construction, and would consist primarily of watering for dust control. Consequently, decommissioning water use would not be considerable and would not result in adverse environmental effects. It is expected that much of the solid waste generated during decommissioning would be recyclable materials; the small amount of non-recyclable materials that would go to local or regional landfills would not be expected to exceed the available landfill disposal capacity.

4.17.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the CD-IV Project (Construction, Operation and Maintenance, and Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.17.3.

a) Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services.

Construction, Operation and Maintenance, and Decommissioning

Fire Protection. As described above, construction would not result in a significant increase of local population or housing that would increase demand for fire protection services. The operation and maintenance phase would result in only six full-time employees, and the decommissioning phase would result in a similar number of temporary employees as CD-IV Project construction; therefore, demand for fire protection services during operation or decommissioning would similar to or less than demand during construction. Thus, CD-IV Project construction, operation and maintenance, and decommissioning would not result in the need for new or physically altered fire protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives. No impact would occur.

Police Protection. As described above, Project construction would not result in a significant increase of local population or housing that would increase demand for police protection services. The operation and maintenance phase would result in only six full-time employees, and the decommissioning phase would result in a similar number of temporary employees as CD-IV Project construction; therefore, demand for police protection services during operation or decommissioning would similar to or less than demand during construction. Thus, CD-IV Project construction, operation and maintenance, and decommissioning would not result in the need for new or physically altered police protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives. No impact would occur.

Schools. As described above, CD-IV Project construction would not result in a significant increase of local population or housing that would increase demand for school-related services. The operation and maintenance phase would result in only six full-time employees, and the decommissioning phase would result in a similar number of temporary employees as CD-IV Project construction; therefore, demand for school-related services during operation or decommissioning would similar to or less than demand during construction. Thus, construction, operation and maintenance, and decommissioning would not result in the need for new or physically altered school facilities in order to serve school-aged children. No impact would occur.

Other Public Facilities. The CD-IV Project would not result in substantial adverse impacts related to other types of public facilities (e.g., public libraries, hospitals, or other civic uses) because, as discussed above, it would not result in a significant increase of local population or housing, which is typically associated with increased demand for public facilities. Therefore, the CD-IV Project would not have an effect on the service goals of other public services and would have a no impact associated with the provision of new or physically altered facilities for libraries, hospitals, or other civic uses. No impact would occur.

b) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board.

Construction, Operation and Maintenance, and Decommissioning

The CD-IV Project would neither be supported by, nor need to be supported by, a wastewater treatment provider. Portable restroom facilities used during Project construction would be maintained by a local contractor, and permanent employees would use existing facilities located in the existing Casa Diablo Geothermal Complex. No impact would occur.

c) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Construction, Operation and Maintenance, and Decommissioning

Implementation of the CD-IV Project would not result in the installation of new facilities for the treatment of water or wastewater. The CD-IV Project would not require any connections to local or regional water or wastewater treatment systems, and would not provide water or wastewater to any such systems. The geothermal fluids that would be extracted by the CD-IV Project are generally not potable and would be injected back into the ground as part of the closed loop system. The CD-IV Project would not require the construction or expansion of any off-site wastewater treatment facilities, and no impact would occur.

d) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Construction, Operation and Maintenance, and Decommissioning

The CD-IV Project would implement PDM HYD-5, as discussed in Section 4.19, *Water Resources*, which entails preparation of a site-specific drainage and runoff management plan. This plan would apply to all new roads and would ensure that off-site stormwater would be intercepted in ditches and channeled around well sites. Changes in drainage patterns and increased impervious surface areas at other CD-IV Project facilities would be mitigated through implementation of Mitigation Measure HYD-A. The preparation of a Comprehensive Drainage

Plan under this mitigation would ensure that construction of new stormwater drainage facilities would result in a less than significant impact.

e) Not have sufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements.

Construction, Operation and Maintenance, and Decommissioning

Construction of the CD-IV Project may temporarily increase the demand for potable water at the Project site for use by construction workers, but even the peak construction workforce of up to 120 workers would be negligible in relation to the population served by MCWD. With only six new workers required for operation and maintenance of the CD-IV Project, the increase in water demand would be inconsequential. Water use during decommissioning, for such uses as dust control, would be less than that required for construction activities. Consequently, construction, operation and maintenance, and decommissioning of the CD-IV Project would not require new or expanded water supply resources or entitlements and the impact would be less than significant.

f) Result in a determination by the wastewater treatment provider that would serve or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments.

Construction, Operation and Maintenance, and Decommissioning

As discussed above, the CD-IV Project would not require or result in a new connection to a wastewater treatment facility or provider, and no existing connection exists on site. Therefore, the Project would not contribute additional wastewater flows to any wastewater treatment provider or facility, and so would not require or utilize available or new capacity at any wastewater treatment plant. No impact would occur.

g) Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs.

Construction, Operation and Maintenance, and Decommissioning

Operation and maintenance of the CD-IV Project would result in the generation of only minor amounts of solid waste. Construction and decommissioning could result in greater volumes of solid waste, much of which could be recycled, such as the pipeline material. Although a small portion of this material could be sent to local or regional landfills, this would represent a small fraction of the existing landfill waste stream being sent to the Benton Crossing Landfill. Based on the anticipated landfill capacity described in Section 3.17, sufficient capacity is anticipated to be available to handle disposal of non-recyclable waste in support of the Project, and this impact is considered to be less than significant.

h) Not comply with federal, state, and local statutes and regulations related to solid waste.

Construction, Operation and Maintenance, and Decommissioning

The disposal of spent oil, lubricants, wastewater treatment chemicals, other chemicals, and other solid waste could require special handling or disposal procedures. Disposal and waste handling for all waste flows generated on site during CD-IV Project construction, operation and maintenance, and decommissioning would be completed in accordance with applicable state and local laws and policies. Therefore, no impact would occur.

4.17.5 Alternative 2: Plant Site Alternative

4.17.5.1 Direct and Indirect Impacts

Capacity of Utilities and Public Services

Construction, Operation and Maintenance, and Decommissioning

Public Services. The construction, operation and maintenance, and decommissioning workforces are anticipated to be the same as for the Proposed Action; therefore, these phases would result in the same effects on the ability of public service providers to maintain acceptable service ratios, response times, and other performance measures.

Utilities. Construction, operation, and maintenance, and decommissioning of Alternative 2 would result in similar water, wastewater, stormwater drainage, and solid waste effects as would the Proposed Action.

4.17.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 2 would be less than significant.

4.17.6 Alternative 3: Modified Pipeline Alternative

4.17.6.1 Direct and Indirect Impacts

Capacity of Utilities and Public Services

Construction, Operation and Maintenance, and Decommissioning

Public Services. The construction, operation and maintenance, and decommissioning workforces are anticipated to be the same as for the Proposed Action; therefore, these phases would result in the same effects on the ability of public service providers to maintain acceptable service ratios, response times, and other performance measures.

Utilities. Construction, operation, and maintenance, and decommissioning of Alternative 3 would result in similar water, wastewater, stormwater drainage, and solid waste effects as would the Proposed Action.

4.17.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the Proposed Action. Potential impacts of Alternative 3 would be less than significant.

4.17.7 Alternative 4: No Action

4.17.7.1 Direct and Indirect Impacts

Capacity of Utilities and Public Services

Public Services. Under this alternative, the BLM would not approve the CD-IV Project. Direct and indirect impacts related to the construction, operation and decommissioning of the proposed power plant or pipelines would not occur. However, in Basalt Canyon up to 11 additional exploration wells which were authorized in previous NEPA and CEQA documents may be drilled for exploratory purposes. Impacts on public services resulting from the construction of exploratory wells would be similar to constructing development wells have been analyzed previously.

If Alternative 4 were implemented, no changes would be implemented on the power plant site and the existing environmental setting described in Draft EIS/EIR Chapter 3 would be maintained except for potential exploratory well construction in Basalt Canyon. Therefore, the No Action Alternative would result in negligible changes to conditions related to public services.

Utilities. As described above, under this alternative, up to 11 additional wells may be drilled that have already undergone environmental review. If Alternative 4 were implemented, it would not result in increased water consumption, generate wastewater, or generate solid waste, it would have no impact on the capacity of utilities and service systems to serve demand.

4.17.7.2 CEQA Significance Determination

Because the No Action Alternative would not introduce any additions to the service populations of the public services in the Project vicinity, it would have no impact on the provision of these services. No demand on utilities and service systems would be required; therefore, no impact would occur.

4.17.8 Cumulative Impacts

4.17.8.1 Geographic Extent/Context

The geographic scope of the cumulative effects analysis for utilities and public services includes the areas served by the local law enforcement agencies and fire protection districts, the MCWD, the Mammoth School District, and the Benton Crossing Landfill.

4.17.8.2 Existing Cumulative Conditions

The CD-IV Project area consists of relatively rural and forested land, administered primarily by the USFS as part of the Inyo National Forest in unincorporated Mono County. Existing geothermal power plants, pipelines, and ancillary facilities are located in the Project area.

4.17.8.3 Reasonably Foreseeable Projects

A wide variety of past, present, and reasonably foreseeable future development projects could contribute to the cumulative conditions in the cumulative analysis area. Table 4.1-1, in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the CD-IV Project site and surrounding area that were used to develop this analysis of cumulative effects. Applications for projects that could be developed in the vicinity of the CD-IV Project include the MP-I Replacement Project, which could be developed approximately 0.25 mile southeast of the proposed CD-IV power plant. The MP-I Replacement Project would continue to utilize the existing geothermal resource in Basalt Canyon and use the existing pipeline that connects to the current MP-I power plant.

4.17.8.4 Construction, Operation and Maintenance, and Decommissioning

The CD-IV Project would have no impact with respect to public services for fire and police protection, schools, other public services and facilities, wastewater treatment requirements/capacity, new water/wastewater treatment facilities, or solid waste regulations. Therefore, it would not contribute to cumulative impacts in these areas.

The CD-IV Project would result in less than significant impacts regarding stormwater drainage facilities. The MP-I Replacement Project would have similar drainage facilities as the Proposed Action and it is anticipated that mitigation applied to the MP-I Replacement Project would avoid significant deleterious effects, without contributing to a cumulatively considerable change. The CD-IV Project would also result in less than significant impacts regarding landfill capacity. It is anticipated that much of the solid waste generated from the CD-IV Project and MP-I would be recycled, including during decommissioning. The Benton Crossing Landfill is anticipated to have sufficient capacity available through 2023. If this landfill is not available beyond 2023, it is expected that other landfills in the area would have sufficient capacity. Therefore, in consideration of potential combined effects of the CD-IV Project plus other reasonably foreseeable projects, it is unlikely that Project-related impacts to public services and utilities would result in a combined impact that would cause an adverse cumulative effect.

4.17.8.5 CEQA Significance Determinations

The CD-IV Project would have no impact with respect to public services for fire and police protection, schools, other public services and facilities, wastewater treatment requirements/capacity, new water/wastewater treatment facilities, or solid waste regulations. The CD-IV Project would have less than significant impacts regarding stormwater drainage facilities and landfill capacity. For the reasons described above, the CD-IV Project's contribution to cumulative impacts with respect to utilities or public services would not be cumulatively considerable.

4.17.9 Mitigation Measures

No mitigation measures are recommended.

4.17.10 Residual Impacts after Mitigation Incorporated

Because no mitigation measures are recommended, impacts to utilities and public services for the Proposed Action and alternatives would be the same as discussed above.

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4.18 Visual Resources

4.18.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the possible impacts to visual resources. Impacts are identified and evaluated based on relevant BLM stipulations, USFS standards, policies, and guidelines and recent studies for similar projects in the same area, including:

1. BLM Geothermal Leases CACA-14407 and CACA-14408 “No Surface Occupancy” Stipulation
2. National Forest Landscape Management: Volume 2, Chapter 2, The Visual Management System, Agriculture Handbook Number 462 (USFS, 1974)
3. USFS Inyo National Forest Land and Resource Management Plan (1988)
4. Mammoth Pacific I (MP-I) Replacement Project Revised Draft Environmental Impact Report, State Clearinghouse 2011022020 (Mono County, 2012)
5. Basalt Canyon Geothermal Pipeline Project Environmental Assessment/Draft Environmental Impact Report (EA/Draft EIR) (BLM and Mono County, 2005)

Recent studies prepared for both the MP-I Replacement Project and the Basalt Canyon Geothermal Pipeline Project are relevant because both include components similar to those under the Proposed Action and Alternatives and both overlap in area with the CD-IV Project. Specifically, the EA/Draft EIR prepared for the Basalt Canyon Geothermal Pipeline Project includes a visual resources analysis for the Basalt Canyon geothermal pipeline and the Draft EIR for the MP-I Replacement Project includes a visual resources analysis for replacement of the MP-I facility. The methodology used in this analysis is a three step process:

1. Identify where the Proposed Action and Alternatives intersect the USFS “retention” and “partial retention” Visual Quality Objective (VQO) areas, as well as BLM Geothermal Leases CACA-14407 and CACA-14408 “No Surface Occupancy” stipulation areas (indicated in Figures 3.18-1 and 4.18-1).
2. Evaluate the direct and indirect effects of the Proposed Action in the Project area and consider effectiveness of PDMs in relation to VQO requirements on USFS lands.
3. Evaluate response to VQOs in relation to LRMP compliance, CEQA significance criteria and the effectiveness of PDMs. Determine the need for implementing mitigation measures and the need for Forest Supervisor approval for deviations from the Land and Resource Management Plan on USFS lands in accordance with Forest wide standards.

4.18.1.1 USFS Visual Management System

The USFS Visual Management System was originally created to establish the “visual landscape” as a basic resource and to ensure that the visual environment is “treated as an essential part of and receive(s) equal consideration with the other basic resources of the land” (USFS, 1974). As the Proposed Action would occur mostly on USFS lands, the Proposed Action is evaluated against the USFS Visual Management System's VQOs, which apply only to USFS lands, which have been mapped throughout the Project area. The "retention" designation only allows activities that are not visually evident, activities that would repeat form, line, color and texture of the surrounding characteristic landscape. The "partial retention" designation also requires that management activities (which includes activities under the Proposed Action) be subordinate to the characteristic landscape, but does allow 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 dominance of the characteristic landscape. Retention and Partial Retention VQO areas are mapped in Figure 4.18-1.

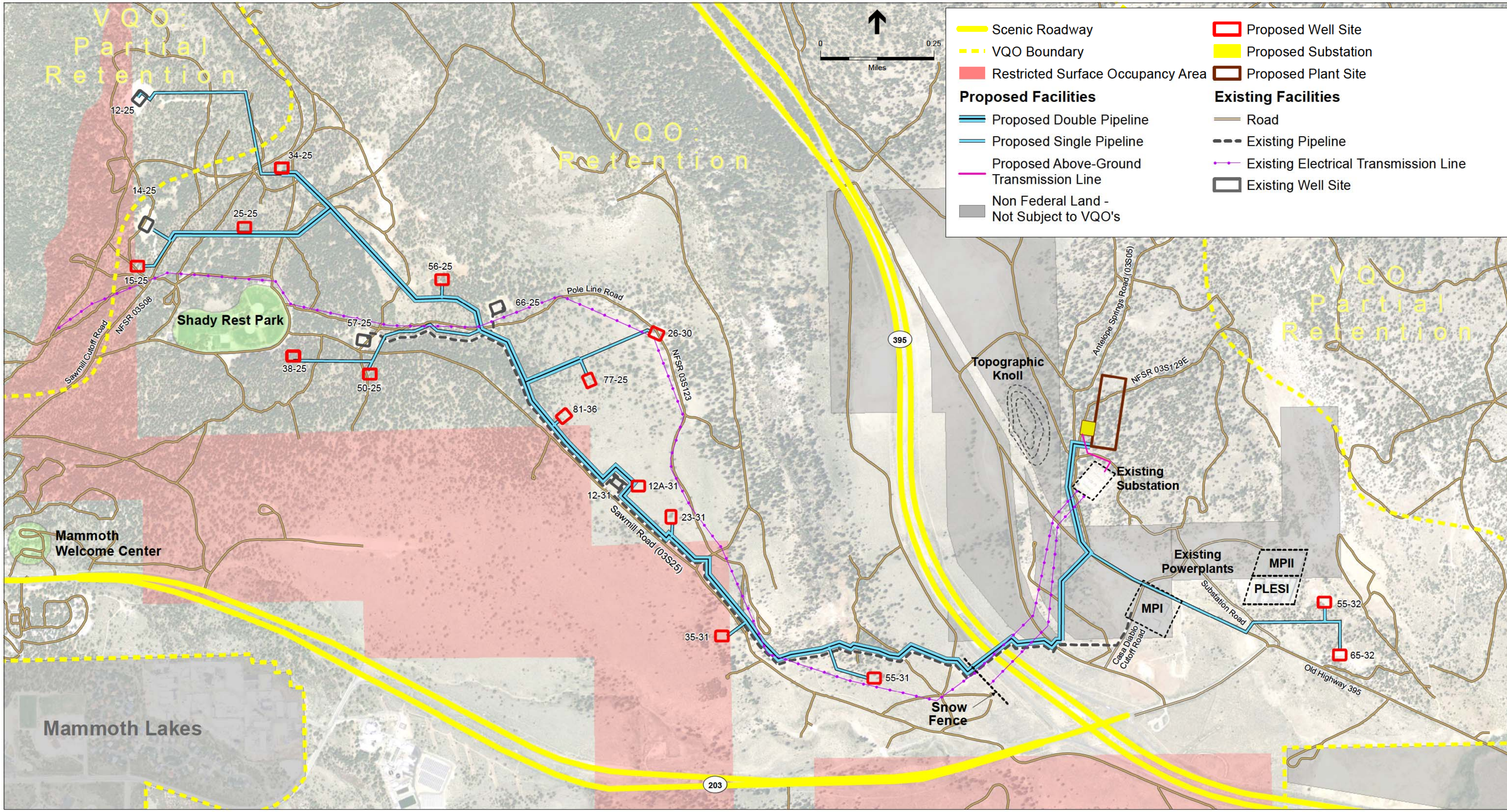
In addition, the USFS Visual Management System consists of two additional VQOs including "modification" and "maximum modification." The "modification" designation allows management activities that may visually dominate the original characteristic landscape; however, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that that its visual characteristics are those of natural occurrences within the surrounding area or character type. The "maximum modification" designation allows management activities of vegetative and landform alternations that may dominate the characteristic landscape; however, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, activities consistent with the "maximum modification" designation may not appear to completely borrow from the naturally established form, line, color, or texture and may be out of scale or contain detail which is incongruent with natural occurrences as seen in the foreground or middle ground (USFS, 1974).

4.18.1.2 BLM Geothermal Leases CACA-14407 and CACA-14408 "No Surface Occupancy" Stipulation

As described in Section 3.18, *Visual Resources*, portions of 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 …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." As presented in Figure 4.18-1, western portions of the Project area are within the "No Surface Occupancy" areas. This analysis evaluates whether the Proposed Action would conflict with this stipulation.

4.18.1.3 Overview of Key Observation Points

KOPs are specific points which represent important views of the Proposed Action and Project area. KOPs are selected to be close as possible to the Proposed Action to be representative of how the public perceives the affected landscape. The "public" may include highway travelers, travelers on local roads, and recreationists using nearby trails and USFS service roads. The sensitivity of these diverse user groups to changes in the landscape are influenced by a number of factors, including how prominent the view of the Proposed Action is (in terms of scale, distance



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

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Figure 4.18-1

USFS Visual Quality Objectives for the Proposed Project

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and angle of observation), the frequency and duration that viewers are exposed to the view, and whether the viewer groups are aware of their surroundings or expectant of high-quality views. As described in Section 3.18, *Visual Resources*, the KOPs are selected to include Project facilities visible within the USFS's "retention" VQO and the scenic highway corridors. Potential KOPs were identified along both SR 203 and U.S. Highway 395 to consider visual effects of the geothermal pipeline alignment. In addition, due to proximity of the proposed well facility (38-25) to Shady Rest Park, the KOP from the Shady Rest parking lot is included in this analysis.

Based on the above factors, and as described in Section 3.18, three KOPs (Photos 1, 3, and 4 in Figures 3.18-2 and 3.18-3) were selected to evaluate the Project site's existing conditions and potential visual impacts. The location and characteristics of each KOP is summarized in Table 4.18-1, below.

TABLE 4.18-1
KOP LOCATION AND CHARACTERISTICS

ID	Viewpoint Location	Visual Quality Objective (VQO)	Distance to Facilities & direction	Typical Viewers	Relation to Visible Project Facilities
KOP 1	U.S. Highway 395 California Scenic Highway	Retention	500 feet southwest	Motorists	Pipeline crossing under highway.
KOP 2	SR 203 County Scenic Highway	Retention	0.25 mile northeast	Motorists and hikers	Pipeline runs within view of SR 203.
KOP 3	Shady Rest Park parking lot	Retention	20 feet southeast	Park visitors and recreationists	Well facility site adjacent to Shady Park and pipeline immediately adjacent to Sawmill Road (03S25).

4.18.2 Project Design Measures

The analysis assumes that the following PDMs related to visual resources are fully implemented:

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 VQO of "partial retention" and "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 SR 203 and/or U.S. Highway 395 will use non-reflective 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.

5. *LU-1*: 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).

4.18.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to visual resources if it would:

a) Have a substantial adverse effect on a scenic vista;

b) Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a State scenic highway;

c) Substantially degrade the existing visual character or quality of the site and its surroundings; or

d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

In addition to the CEQA significance criteria, consistency with the USFS Visual Management System for this area is an important evaluation criterion, since the CD-IV Project is within Inyo National Forest and has designated VQOs as discussed. Furthermore, consistency with the BLM Geothermal Leases CACA-14407 and CACA-14408 “No Surface Occupancy” stipulation is also evaluated since this aims to protect critical visual zones along U.S. Highway 395, SR 203, and Sawmill Cutoff Road (NFSR 03S08). While consistency with both VOQs and the BLM “No Surface Occupancy” stipulation is desirable, an adverse effect created by an inconsistency with USFS VQOs and/or the “No Surface Occupancy” stipulation, however, does not necessarily require mitigation under CEQA.

4.18.4 Alternative 1: Proposed Action

4.18.4.1 Direct and Indirect Impacts

Consistency with USFS Visual Management System and BLM Geothermal Leases CACA-14407 and CACA-14408 “No Surface Occupancy” Stipulation

The primary tools used to analyze visual impacts of the Proposed Action are the USFS’ Visual Management System VQO’s as assigned by the LRMP as well as the BLM Geothermal Leases CACA-14407 and CACA-14408 “Restricted Surface Occupancy” stipulation, which are presented in Figure 4.18-1. An evaluation of the Proposed Action’s consistency and/or inconsistency with the USFS Visual Management System and the BLM “No Surface Occupancy” stipulation is described for each main Project component (including power plant, well site facilities, and geothermal pipelines). This tool was also used to analyze the visual impacts of the

Project from three KOPs. Table 4.18-2 summarizes the following information for each Project component: location, existing VQO, visibility and visual effects, and VQO's with implementation of the Project components. Where applicable, the VQO for Project components are defined for the short-term (i.e., within 10 years when vegetation screening is in the early development phase), long-term (after 10 years when vegetation screening is mature), and winter and summer months.

Power Plant

The CD-IV power plant would be constructed in an area surrounded by Jeffrey Pine trees and would be sited north of the existing SCE substation and transmission lines. The power plant itself would look very much like the power plants already on site, as shown in Figure 4.18-2, Photo 1. The base elevation of the proposed power plant would be approximately 50 feet higher than the existing power plants, and the facility would be behind and below the forested knoll that screens views from U.S. Highway 395 and SR 203, as shown in Figure 4.18-2, Photo 2. The power plant may be partially visible to drivers along southbound U.S. Highway 395 but views of the facility would be fleeting due to the speed of travel.

From more distant public viewing locations (i.e., from eastbound SR 203) the power plant would also be hidden behind the knoll, trees, and transmission lines. A viewshed analysis was conducted by the USFS for the proposed power plant in January 2013. This analysis was solely focused on topography and did not consider density or height of trees. The power plant could potentially be seen from locations ranging 4 to 8 miles south, southwest and southeast of the power plant site. Although unlikely (due to distance), the site could also be visible from a few locations approximately 16.5 miles southeast of the plant site. While it is possible that the plant could be seen from the above-described areas, the likelihood that the power plant would be visible from these areas is low given the mountainous and heavily forested landscape in the vicinity.

Antelope Springs Road (03S05) passes directly by the proposed power plant site. This road is most commonly used by recreationists, USFS workers and SCE substation maintenance workers. Still, motorists travelling on Antelope Springs Road (03S05) would have direct and close-up views of the proposed power plant, an industrial facility which would look similar to the existing power plant shown in Figure 4.18-2. Similar to the existing power plant, the new one would have an overall rectangular form and the various pumps, pipelines would represent multiple linear features. Implementation of PDM VIS-4 would require ORNI 50, LLC to paint the plant a neutral color to blend with the existing environment. However, even with implementation of PDM VIS-4, the power plant would still be clearly visible in the foreground (within 300 feet of Antelope Springs Road (03S05)) and would dominate the characteristic landscape from this viewpoint. When viewed from the middle ground, the rectilinear features and smooth textures of the facility may be visually evident but the power plant would not dominate the landscape because the majority of the facility would be screened by the knoll, and trees. Therefore, introducing the new power plant to the landscape would result in an inconsistency with the VQO of "retention" in this portion of the Project area. To screen views of the power plant site from Antelope Springs Road (03S05), ORNI 50, LLC should implement **Mitigation Measure VIS-3 (Power Plant Landscape Plan)**, which requires immediate and effective landscaping improvements along the northeastern corner of the plant. Implementation of PDM VIS-4 and landscaping would reduce

TABLE 4.18-2
VISUAL EFFECTS SUMMARY BY CD-IV PROJECT COMPONENT

Component	Viewpoint Location(s)	Visual Quality Objective (VQO)	Distance to Facilities	Visibility and Visual Effects	VQO with CD-IV Project Component
Power Plant	- Antelope Springs Road - U.S. Highway 395 and State Route 203	Retention	- Within 300 feet from Antelope Springs Road (foreground) - Over 0.5 mile east of Highway 395 and State Route 203 (middleground)	- Power plant would be clearly visible from Antelope Springs Road in the foreground. - From U.S. Highway 395 and State Route 203, power plant would be obscured by existing knoll and trees. Due to speed of travel of motorists traveling on U.S. Highway 395 and State Route 203, effects on views would be moderate. - PDM VIS-4 would ensure color of plant blends in with surrounding landscape during the spring/summer months. Mitigation Measure VIS-3 would help screen the facility and ensure that facilities remain subordinate to characteristic landscape in the long-term.	Maximum Modification during winter months and in the short term (up to 10 years). Partial Retention during summer months and in the long term (after 10 years, when vegetation screening matures).
Well Facilities					
81-36 12A-31 23-31 35-31 55-31	Sawmill Road (NFSR 03S25)	Retention	- Within 300 feet from Sawmill Road (foreground)	- Adjacent to Sawmill Road (03S25), which is commonly used by recreationists; visibility would be moderate/high. - The smooth texture, rectilinear form, and straight lines of the wells and the three adjacent parallel pipelines (spanning 12 feet in width) would introduce an industrial facility uncommonly seen in the existing environment or surroundings Although the existing Basalt Canyon pipeline and well 12-31 are visible from Sawmill Road, the introduction of these facilities would further detract from the predominantly natural landscape. With the exception of well 81-36, all other facilities would be primarily surrounded by sagebrush scrub within the foreground, and other low-lying vegetation that vary in color (e.g., tan, brown and dark green). Vegetation would create a minor visual barrier of the well site as vegetation would rise a few feet aboveground. Height of well facility 81-36 would be surrounded by Jeffrey pines and would remain below 15 feet, generally below the height of surrounding mature trees. - PDM VIS-4 would ensure that the color of the facilities blend in with the existing environment or surroundings during the spring/summer months. During winter months when snow is present, the facilities would be more visually evident since the facilities would contrast with the snow. Mitigation Measure VIS-1 would provide screening and ensure that facilities remain subordinate to existing environment in the long-term.	Modification in the short-term and long-term and throughout all seasons.
26-30	Pole Line Road	Retention	- Within 300 feet from Pole Line Road (foreground)	- Clearly visible from Pole Line Road (NFSR 03S123) which is commonly used by recreationists; visibility would be high from this viewpoint. - The smooth texture, rectilinear form, and straight lines of the wells would introduce an industrial facility uncommonly seen in the existing environment or surroundings. Although segments of the existing Basalt Canyon pipeline and well 66-25 are visible from Pole Line Road, the introduction of this facility would further detract from the predominantly natural landscape. The site would be primarily surrounded by low-lying sagebrush scrub in the foreground and some Jeffrey pines, which would partially obscure views of the facility. The height of facilities would remain below 15 feet and generally below the height of surrounding mature trees.	Modification during winter months and in the short-term. Partial Retention during summer months and in the long-term.

TABLE 4.18-2 (Continued)
VISUAL EFFECTS SUMMARY BY CD-IV PROJECT COMPONENT

Component	Viewpoint Location(s)	Visual Quality Objective (VQO)	Distance to Facilities	Visibility and Visual Effects	VQO with CD-IV Project Component
Well Facilities (cont.)					
				- PDM VIS-4 would ensure that the color of the facilities blend in with the existing environment or surroundings during the spring/summer months. During winter months when snow is present, the facilities would be more visually evident since the facilities would blend with surrounding vegetation. Mitigation Measure VIS-1 would provide screening and ensure that facilities remain subordinate to existing environment.	
77-25 50-25 56-25	Sawmill Road (NFSR 03S25)	Retention	- Beyond 300 feet from Sawmill Road (middleground)	- Due to distance from road, well facilities would not be readily visible from Sawmill Road (NFSR 03S25); visibility would be low. - The smooth texture, rectilinear form, and linear features of the wells would introduce an industrial facility uncommonly seen in the existing environment or surroundings. Although the existing Basalt Canyon pipeline is visible from this road, the introduction of these facilities would detract from the predominantly natural landscape. The facilities would be surrounded by a relatively dense cover of Jeffrey pines (~50% cover) interspersed with low-lying sagebrush scrub. The height of facilities would remain below 15 feet and generally below the height of surrounding mature trees, which would partially obscure views of the facility from the road. - PDM VIS-4 would ensure that the color of the facilities blend in with the existing environment during the spring/summer months. During winter months when snow is present, the facilities would be more visually evident since the facilities would blend with surrounding vegetation. Mitigation Measure VIS-1 would provide screening and ensure that facilities remain subordinate to existing environment in the long-term.	Partial Retention in the short-term and long-term and throughout all seasons.
15-25 34-25 25-25	Sawmill Cutoff Road (NFSR 03S08)	Retention	- 15-25 and 34-25 would be within 300 feet from Sawmill Cutoff Road (foreground) - 25-25 would be beyond 300 feet (middleground)	- Wells would be clearly visible from Sawmill Cutoff Road (03S08) in the foreground. - The smooth texture, rectilinear form, and linear features of the wells would introduce an industrial facility not seen in the existing environment or surroundings. The facilities would be primarily surrounded and largely obstructed in view by mature Jeffrey pines (90-100% cover).The height of facilities would remain below 15 feet and generally below the height of surrounding trees. Ground cover is sparsely found in the vicinity of these sites. - PDM VIS-4 would ensure that the color of the facilities blend in with the existing environment during the spring/summer months. During winter months when snow is present, the facilities would be more visually evident since the facilities would be painted colors that blend with surrounding vegetation. Mitigation Measure VIS-1 would provide screening and ensure that facilities remain subordinate to existing environment in the long-term.	In the short-term and during winter months, wells 15-25 and 34-25 would have a VQO of Modification. In the long-term, these wells would have a VQO of Partial Retention when vegetation screening matures. Well 25-25 would have a VQO of Partial Retention (due to distance from road).

TABLE 4.18-2 (Continued)
VISUAL EFFECTS SUMMARY BY CD-IV PROJECT COMPONENT

Component	Viewpoint Location(s)	Visual Quality Objective (VQO)	Distance to Facilities	Visibility and Visual Effects	VQO with CD-IV Project Component
Well Facilities (cont.)					
55-32 65-32	Old Highway 395	Retention	- 55-32 would be approximately 0.25 mile from Old Highway 395 - 65-32 would be within 300 feet from Highway 395 (foreground)	- The texture and rectilinear form (consisting of straight lines) of the well facilities would not blend with the natural forested environment. Height of facilities would remain below 15 feet. - Due to topography and presence of trees, both sites would not be visible from Old Highway 395. - Because these well sites would not be readily visible and would remain subordinate to the existing environment, no mitigation is required.	Retention in the short-term and long-term and throughout all seasons.
38-25	Shady Rest Park (KOP 3), Sawmill Road	Retention	- Within 300 feet of Shady Rest Park and Sawmill Road (foreground)	- Highly visible from Shady Rest Park parking lot in the foreground and Sawmill Road (03S25), which is highly used by recreationists. - The smooth texture, rectilinear form, and linear features of the wells would introduce an industrial facility uncommonly seen in the existing environment. Although the Basalt Canyon pipeline and well 57-25 are visible from Sawmill Road, introduction of this facility would further detract from the predominantly natural landscape. The site is surrounded by a dense stand of mature Jeffrey pines, which would obstruct views of the facility from Shady Rest and Sawmill Road. The height of facilities would remain below 15 feet and generally below the height of surrounding trees. - PDM VIS-4 would ensure that the color of wells blend in with surrounding forest. Mitigation Measure VIS-1 would help screen the facility but due to its close proximity to a highly used recreational area, the facility would dominate the existing environment in the foreground.	Modification in the short-term and long-term and throughout all seasons.
Geothermal Pipeline					
Pipeline	Sawmill Cutoff Road (03S08), Shady Rest Park	Retention	- Within 300 feet from either Sawmill Cutoff Road or Shady Rest Park (foreground)	- Proposed geothermal pipeline and aboveground pipeline crossovers would be visible to recreationists using Shady Rest Park and Sawmill Cutoff Road. Expansion loops may rise 15 to 20 feet aboveground. Where pipeline crosses beneath roadway, recreationists and motorists would have immediate views of the pipeline on either side of the road. - Pipeline and pipeline crossings would introduce additional smooth and linear features not seen in the existing environment. Although the density of surrounding vegetation varies, existing sagebrush scrub and Jeffrey pines would help screen views of portions of the geothermal pipeline. - Implementation of PDMs VIS-1 and VIS-3 would require screening of pipeline near Shady Rest Park and use of colors that allow pipeline to blend with surrounding landscape. Mitigation Measures VIS-1 and 2 would further reduce adverse visual effects of the pipeline.	Modification during winter months and in the short-term (before vegetation screening matures). Partial Retention during summer months and in the long term (when vegetation screening matures).

TABLE 4.18-2 (Continued)
VISUAL EFFECTS SUMMARY BY CD-IV PROJECT COMPONENT

Component	Viewpoint Location(s)	Visual Quality Objective (VQO)	Distance to Facilities	Visibility and Visual Effects	VQO with CD-IV Project Component
Geothermal Pipeline (cont.)					
Pipeline	- Sawmill Road - U.S. Highway 395 (KOP 1) - State Route 203 (KOP 2)	Retention	- Within 300 feet from Sawmill Road (foreground) - From KOP 1, within foreground and middleground - From KOP 2, beyond 300 feet (middleground)	- The new production and injection pipelines would be aligned adjacent to the existing Basalt Canyon pipeline. Pipeline crossings and areas where the pipeline crosses beneath the road near Sawmill Road would be visible in the foreground. - The pipelines (spanning approximately 12 feet wide) would be low to the ground and would follow the form of the landscape but would introduce lines and a smooth texture uncommonly seen in the existing environment. Although segments of the existing Basalt Canyon pipeline are partially visible from these viewpoints, the introduction of the new pipelines would further detract from the predominantly natural landscape. Although the density of surrounding vegetation varies, existing sagebrush scrub and Jeffrey pines would help screen views of portions of the geothermal pipeline. - From KOP 1 and KOP 2, views of the pipeline would be fleeting due to speed of travel, but the 12 feet of pipeline would be within middle and foreground views. - Implementation PDM VIS-3 and Mitigation Measures VIS-1 and VIS-2 would help reduce adverse visual effects of the pipeline by requiring landscape screening and reduction of the pipeline crossover heights but implementation of two new parallel to an existing pipeline would dominate the existing environment in the foreground. From KOPs 1 and 2, due to distance and with implementation of mitigation measures.	Modification (from Sawmill Road, KOP 1, and KOP 2) in the short-term and long-term, and throughout all seasons.
Access Roads	Various locations	Retention	Various locations	- Segments of the new access roads would alter the landscape since the clearing of brush would be required. These roads would be visually evident but remain subordinate to the existing environment.	Partial Retention in the short-term and long-term, and throughout all seasons.

Photo 1 Existing geothermal power plant near junction of Highway 395 and SR 203, looking west

Photo 2 View from Junction of Highway 395 and SR 203 Looking North. Arrow indicates new power plant location, to be constructed behind the forested knoll. Existing power plant is visible to the right.

SOURCE: ESA

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Figure 4.18-2
Photos of Existing Power Plant and Proposed Site

this inconsistency. Existing screening from the knoll and trees along with the landscaping, would allow the power plant to meet the “maximum modification” VQO in the short-term (i.e., within 5 years). During winter months, when the color of the plant contrasts with the snow, the plant would meet the “maximum modification” VQO. In the long term, if 65 percent of the power plant is successfully screened (as prescribed in Mitigation Measure VIS-3), and during the summer months when the power plant is the same color as the surrounding vegetation, the plant would meet the “partial retention” VQO.

The power plant is not located within portions of Geothermal Leases CACA-14407 and CACA-14408 covered by the “Restricted Surface Occupancy” stipulations.

Well Site Facilities

Well site facilities (including the well head, pump motor, pump control building, well head fence and well site pipeline) would be hidden or fully obscured from view by vegetation and terrain from designated scenic highways. However, as described below, several well facilities would be visible from roads such as Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08). As described in Section 4.14, *Recreation*, these roads are highly used for a wide range of recreation activities. During winter seasons, snowmobilers and cross-country skiers would have views of these well facilities. Likewise, during summer months, hikers, mountain bikers, and other recreationists would have views of these well facilities. These facilities would appear similar to existing well facilities constructed on drill site 66-25, shown in Figure 4.18-3. As shown in this figure and described in Section 2.2.4.2, each production well pad area would encompass an approximately 120-foot by 150-foot area, and consist of a wellhead and small motor control building. The production well would not exceed a height of 15 feet aboveground and the motor control building would be approximately 8 feet by 20 feet and rise 10 feet aboveground. Injection well sites would be similar but would not include the small pump building. Impacts on views of well facility site 38-25 from Shady Rest Park are described below under the subheading “Designated Scenic Highways and KOPs.”

Well Site Facilities Visible along Sawmill Road (03S25). Well sites 81-36, 12A-31, 23-31, 35-31, and 55-31would be readily visible in the immediate foreground (i.e., within 300 feet) to viewers traveling on Sawmill Road (03S25). ORNI 50, LLC would paint the well site facilities an appropriate color to blend with the existing environment, which would reduce the visual contrast of these well site facilities (see PDM VIS-4). The “rectilinear” form and straight lines of the well head fence, pump control building and wellhead are not commonly seen in these natural areas. As described in the section below, these well facilities would be located adjacent to three parallel geothermal pipelines (two new pipelines and the existing Basalt Canyon pipeline). Refer to Table 4.18-2 for an overview of the visual effects associated with these facilities. As the well facilities would be sited in a forested area, the introduction of these wells as well as the pipelines would substantially change the existing environment and would be visually evident in the foreground. Therefore, these features would not meet the VQO of “retention” for this portion of the valley floor landscape. Portions of Sawmill Road (03S25), the existing pipeline and well site 35-31 also touch on the perimeter edges of the Restricted Surface Occupancy zone. Implementation of PDM VIS-4 and **Mitigation Measure VIS-1 (Landscape Plan)**, which

Photo 3: View of well facility 66-25 looking north from Pole Line Road.

SOURCE: ESA

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Figure 4.18-3
Photo of Existing Well Facility 66-25

includes immediate and effective landscaping in front of the pipeline in locations where the pipeline would be clearly visible from Sawmill Road (03S25), would help screen views of the well facilities. In the short-term, (i.e., within 5 years) and during winter months, when vegetation screening is still relatively young and when the pipeline color contrasts with snow, respectively, implementation of these measures would ensure that the pipeline meets the “modification” VQO criteria. In the long-term, once screening vegetation has matured, and during the summer months when the pipeline color is similar to surrounding vegetation, the pipeline would be less visually intrusive; however as the well facilities and the pipelines would collectively dominate the landscape, the VQO would remain “modification.”

Well sites 77-25, 50-25, and 56-25 may also be occasionally visible through the forest to recreationists on Sawmill Road (03S25), although distances would be beyond the immediate foreground (beyond 300 feet). Refer to Table 4.18-2 for an overview of the visual effects associated with these facilities. Though these wells would not be readily visible in the foreground from Sawmill Road, the facilities would introduce an industrial facility that is uncommon in the existing environment or surroundings, resulting in a substantial change in the visual character of these sites. Implementation of PDM VIS-4 and **Mitigation Measure VIS-1 (Landscape Plan)**, which requires immediate and effective landscaping in front of the pipeline in locations where the pipeline would be clearly visible from Sawmill Road (03S25), would help screen views of the well facilities in order to meet the “partial retention” VQO criteria in the short-term and long-term.

Well site 26-30 would not be visible from Sawmill Road (03S25) but would be visible from Pole Line Road (NFSR 03S123), a National Forest System Road used by recreationists. Similar to the well sites described above, implementation of PDM VIS-4 and **Mitigation Measure VIS-1** would reduce the visual contrast of these well facilities but would change the existing environment; therefore these facilities would not meet the VQO of “retention” for this portion of the landscape. In the winter months, well 26-30 would be visually inconsistent with the snow; and in the short-term, vegetation would be relatively young and screen a minor portion of the well facility. Thus, during these periods, the site would meet the “modification” VQO. During the summer months and in the long-term (after 5 years), when the well facility color is similar to surrounding vegetation and when vegetation screening has matured, the site would meet the “partial retention” VQO criteria.

Well Site Facilities Visible along Sawmill Cutoff Road (NFSR 03S08). Well site facilities constructed on drill sites 15-25 and 34-25 would be readily visible in the immediate foreground (or within 300 feet) above the sagebrush to viewers traveling on Sawmill Cutoff Road (NFSR 03S08). Well site facility 25-25 may also be occasionally visible through the forest to recreationists on Sawmill Cutoff Road (NFSR 03S08), although the viewing distance from this roadway is beyond the immediate foreground (beyond 300 feet). These facilities would appear similar to the one shown in Figure 3.18-3. The visual effect of these well facilities is summarized in Table 4.18-2.Similar to the well sites described above, implementation of PDM VIS-4 would reduce the visual contrast of these well site facilities. However, even with implementation of PDM VIS-4, well sites within 300 feet of Sawmill Cutoff Road (03S08) (15-25 and 34-25) would still be readily visible, resulting in an inconsistency with the sites’ VQO of “retention” for this portion of the landscape. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)**, which includes immediate and effective landscaping in front of the pipeline in locations where the pipeline would be clearly visible from Sawmill Cutoff Road (NFSR 03S08), would help screen views of the well facilities, however, would still not meet “retention.” In the short-term and during the winter months (when the facility contrasts with snow), wells 15-25 and 34-25 would meet the VQO of “modification;” in the long-term and during the summer months (when the facility is similar in color to the surrounding vegetation), these wells would meet the “partial retention” VQO. Due to distance from Sawmill Cutoff Road, well 25-25 would meet the “partial retention” VQO.

As shown in Figure 4.18-1, the western edge of well facilities 14-25 and 15-25 are within those portions of Geothermal Leases CACA-14407 and CACA-14408 covered by the “Restricted Surface Occupancy” stipulations. However, well facility 14-25 is an existing well and although well facility 15-25 partially overlaps with the “Restricted Surface Occupancy” stipulation, implementation of **Mitigation Measure VIS-1** would help screen views of the facility from Sawmill Cutoff Road (NFSR 03S08).

Well Site Facilities near Old Highway 395. Similar to the well facilities described in the paragraphs above, well site facilities 55-32 and 65-32, would introduce a new industrial facility that is uncommon in the existing environment or surroundings. However, as summarized in Table 4.18-2, these facilities would not be readily visible in the immediate foreground or middleground from Old Highway 395 as these sites would be located on a hillside and views would be screened by trees. Thus, these wells would meet the VQO of “retention” for this portion of the Project area in the short-term and long-term.

Geothermal Pipeline within Retention VQO Designated Areas (Shady Rest Park, Sawmill Cutoff Road and Sawmill Road)

As described in Section 3.18, the Inyo National Forest VQO for the area around Shady Rest Park, Sawmill Cutoff Road (NFSR 03S08), Sawmill Road (03S25), U.S. Highway 395, and State Route 203 is “retention.” Only those activities that would repeat form, line, color and texture of the surrounding landscape would meet this VQO.

Sawmill Cutoff Road and Shady Rest Park. The new pipelines would be eight to 24-inch diameter welded-steel pipe and the overall outside diameter would range from 12 to 28 inches with insulation included. The pipelines would be constructed near ground level on pipeline supports and would appear similar to the existing Basalt Canyon pipeline (as shown in Figure 3.18-4, Photos 5 and 6). Recreationists along Sawmill Cutoff Road (NFSR 03S08), including hikers, joggers, mountain bikers, snowmobilers, and cross country skiers, may notice the pipelines, and the taller crossovers. These bends would typically be horizontal (approximately 40 feet by 40 feet) but in some cases the loops would be vertical, ranging 15 to 20 feet high. To reduce the visual impact of the proposed geothermal pipeline in this area, ORNI 50, LLC would implement PDMs VIS-1 and VIS-3, described under Section 4.18.2, above. PDM VIS-1 would require that any pipeline route selected within the pipeline corridor either be 300 feet from the developed portions of Shady Rest Park or be substantially screened from view from the developed portions of the park by topography or vegetation. PDM VIS-3 would require that the selected pipeline use texture and color or colors (approved by the authorized officer) selected to blend with the color and texture of the characteristic landscape. However, similar to what is shown in Figure 3.18-4, a segment of the pipeline connecting to well facility 15-25 would parallel Sawmill Cutoff Road (NRSR 03S08) within 300 feet of the road. Although the pipeline would be built low to the ground, due to proximity, the top of the pipeline would be visible above adjacent vegetation from Sawmill Cutoff Road. As the horizontal pipeline would be visually evident in the foreground from along this roadway, the pipeline near well facility 15-25 would result in an inconsistency with the VQO of “retention” for this portion of the Project area. Similarly, near well facilities 14-25 and 34-25, the proposed geothermal pipeline would cross Sawmill Cutoff Road (NFSR 03S08). Although the pipeline would be constructed beneath the road, recreationists would have immediate views of the pipeline on either side of Sawmill Cutoff Road (NFSR 03S08), which would be clearly visible above vegetation on either side of the road and would also result in an inconsistency with the VQO of “retention” within this area of the Project area. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)**, which includes immediate and effective landscaping in front of the pipeline in locations where the pipeline would be clearly visible from Sawmill Cutoff Road (NFSR 03S08), would help screen views of the pipeline, however, would still not meet “retention.” During the winter months and in the short-term (before vegetation screening matures), the pipeline would meet the “modification” VQO. During summer months and in the long-term (after screening vegetation has matured), the pipeline would meet the “partial retention” VQO.

In addition, from the Knolls Loop, recreationists would have immediate views of the production pipeline crossing over the injection pipeline (or vice versa) in the vicinity of well facility 34-25. The pipeline crossing over the other would be a square or angled bend and would be approximately 8 feet long. At this particular site, recreationists using the Knolls Loop could have immediate views of this pipeline crossing, which would range in height between 5 feet 3 inches and 8 feet 6 inches, depending upon whether angled or square bends are used for the crossover. As this pipeline crossing would clearly rise above the nearby vegetation and in some cases would be at or near eye-level for recreationists, these crossovers would introduce an industrial element to the landscape and would dominate the otherwise natural and forested landscape, resulting in a substantial visual change. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)**, which includes immediate and effective landscaping in front of the pipeline crossing where it would be clearly visible from Knolls Loop, would help screen views of the pipeline. Nonetheless, even with landscaping and given the height of these crossovers, the pipeline crossovers would be clearly visible to recreationists but would remain subordinate to the surrounding forested landscape. Implementation of **Mitigation Measure VIS-2 (Pipeline Crossovers and Expansion Loops)**, which requires lowering the height of either the existing pipeline, new injection pipeline or production pipeline, and use of horizontal expansion loops would minimize the visibility of such pipeline crossovers and would thereby reduce adverse visual effects on recreationists using the Knolls Loop, however, would still not meet “retention.” During the winter months and in the short-term (before vegetation screening matures), the pipeline would meet the “modification” VQO. During summer months and in the long-term (after screening vegetation has matured), the pipeline would meet the “partial retention” VQO.

As shown in Figure 4.18-1, the geothermal pipelines adjacent to Sawmill Cutoff Road (NFSR 03S08) and within the "retention" area would not be located within portions of Geothermal Leases CACA-14407 and CACA-14408 covered by the "Restricted Surface Occupancy" stipulation.

Sawmill Road. A large segment of the proposed geothermal pipelines that would run adjacent to Sawmill Road (03S25) would be visible to various recreationists including hikers, dog-walkers, cross-country skiers, and snowmobilers. As shown in Figure 4.18-1, throughout the majority of the Project area, which is designated as "retention," both a production pipeline and an injection pipeline would be aligned with and parallel to the existing Basalt Canyon pipeline. The pipelines would be an addition and appear similar to the existing pipeline (e.g., built low to the ground but would often be visible above adjacent vegetation along Sawmill Road). At approximately nine points along Sawmill Road (03S25) and Pole Line Road (NFSR 03S123), the production pipeline would cross over the injection pipeline (or vice versa). At such locations, recreationists would have immediate views of these pipeline crossings, which could range between 5 feet 3 inches and 8 feet 6 inches, depending upon whether angled or square bends are used for each crossover. For a description of the visual effects associated with these pipeline crossings, refer to the above for the Knolls Loop. At two points along Sawmill Road (03S25) the pipeline would cross beneath the road (i.e., near well facility sites 50-25, and 35-31). At these particular sites, recreationists would have immediate views of the pipeline on either side of the road. Implementation of PDM VIS-2 would require ORNI 50, LLC to site the new pipeline in such a manner that it would not be immediately adjacent to existing roads where possible and would take advantage of existing vegetation or terrain screening opportunities to reduce the visibility of the pipeline from roads such as Sawmill Road (03S25).

The pipeline's straight lines would generally repeat the straight lines of the adjacent road and existing pipeline. Although the pipelines would be built low to the ground, the three parallel pipelines would be clearly visible (spanning approximately 12 feet wide), the top of the pipelines would often be visible above the vegetation from the roads it parallels in these areas, and the pipeline crossings and crossovers would be clearly visible from Sawmill Road (03S25) at several locations along the roadway. For these reasons, the introduction of these pipelines would dominate the existing environment or surroundings and would substantially alter the visual landscape since three pipelines on the same alignment would no longer be subordinate elements within the meadow or the surrounding mountainous landscape, resulting in an inconsistency with the "retention" VQO rating. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)** and **Mitigation Measure VIS-2 (Pipeline Crossovers and Expansion Loops)**, which includes immediate landscaping, reducing the height of pipelines at crossing points and use of horizontal expansion loops would keep the Project elements subordinate to the landscape to meet "modification" VQO criteria, but would not meet "retention" level criteria. The pipeline would be visually evident to a greater degree during both the winter months and in the short-term as the pipeline color would contrast with the snow and because screening vegetation would be young, respectively.

As shown in Figure 4.18-1, two segments of the pipeline, one near well site 81-36 and the other between well sites 23-31 and 35-31, fall within a portion of Geothermal Lease CACA-14408 covered by the "Restricted Surface Occupancy" stipulation. Although these restrictions were originally adopted to protect visual zones along U.S. Highway 395, SR 203, and Sawmill Cutoff Road (NFSR 03S08), implementation of **Mitigation Measures VIS-1 and VIS-2** would help reduce visual effects in this area through implementation of immediate and effective landscaping, installing pipelines belowground at crossing points and requiring non-vertical expansion loops be used to minimize overall pipeline heights.

Access Roads

As shown in Figure 2-8 in Chapter 2, *Proposed Action and Alternatives*, short segments of new permanent access roads that would connect existing roads to the actual well sites would be constructed in areas where proposed well pads are not immediately adjacent to existing roads. These access road segments would be constructed in the Project area with VQO designations of "retention." Clearing of brush for these new roads would change existing views by adding more human generated activity to the landscape surrounding Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08). Still, these new access road segments would appear similar to existing NFSRs and unauthorized roads in the Project vicinity and would repeat the form, line, color and texture of the surrounding landscape. Additions to the access roads would continue to be subordinate to the visual dominance of the surrounding landscape and would remain consistent with the "partial retention" VQO, though would not meet the higher "retention" criteria.

Designated Scenic Highways and KOPs

As shown in Figure 3.18-2 (Photo 2, KOP 1) and Figure 3.18-3 (Photo 3, KOP 2), short sections of the existing geothermal pipelines east of well site 55-31 are visible from U.S. Highway 395 and SR 203, respectively. Both of these highways are designated scenic highways. Since the geothermal pipelines would be constructed parallel to the existing pipeline, segments of the new pipelines would also be visible to motorists traveling on SR 203 and U.S. Highway 395. Also, as mentioned above, construction of well facility 38-25 would also be highly visible from the Shady Rest Park parking lot. Consistency with the VQOs at each of the three KOPs is described below. None of the Project components within view from the below-described KOPs are within portions of Geothermal Leases CACA-14407 and CACA-14408 that are covered by the "Restricted Surface Occupancy" stipulation; thus consistency with this stipulation is not discussed further.

Views from U.S. Highway 395 – KOP 1. As described above and in Table 4.18-2, the power plant would not be visible from northbound U.S. Highway 395 due to the power plant's siting behind and below the top of a forested knoll that would screen it from view. The top portion of the plant may be partially visible from southbound U.S. Highway 395 but topography and vegetation would both provide screening of the power plant from the highway and SR 203.

Segments of the new geothermal pipelines located east of U.S. Highway 395 could be visible to motorists traveling north along U.S. Highway 395. However, since the existing pipeline is not readily visible from the highway, any views of the new pipelines paralleling the existing pipeline are expected to be fleeting. Segments of the new geothermal pipelines located west of U.S. Highway 395, would be briefly visible to motorists traveling south along U.S. Highway 395 just before the SR 203 off-ramp. Figure 3.18-2, Photo 2 presents an existing view of the Project area from the southbound side of U.S. Highway 395 just north of the SR 203 junction, an area with a "retention" VQO designation. As shown in Figure 3.18-2, Photo 2, the existing geothermal pipeline is partially visible from this vantage point but portions of the pipeline are hidden from view by trees, vegetation, and highway signs. The new pipeline segments and pipeline crossover (which would be between 5 feet 3 inches and 8 feet 6 inches high) would be highly visible from vehicles on an estimated 1,000-foot southbound section of the highway for about 11 seconds, at distances from about 1,100 feet to as little as 200 feet away (BLM and Mono County, 2005). Similar to the existing pipeline, the new pipeline and crossover would introduce additional smooth textures and rectilinear features that are uncommon in the existing environment or surroundings. To reduce the contrast of the pipeline in these areas, ORNI 50, LLC would paint the pipeline a neutral color to blend with the landscape in accordance with PDM VIS-3. However, because portions of the pipelines (including the 12-foot span of parallel pipelines) would be visually evident from U.S. Highway 395 in the middleground and foreground, the pipelines and crossover would still be noticeable and would introduce a smooth texture that is not apparent in the existing environment or surroundings. Thus, views of the pipeline segments from U.S. Highway 395 would be inconsistent with the VQO of "retention" prescribed for this portion of the Project area. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)**, which requires planting of native trees and shrub vegetation in front of the proposed pipeline, and **Mitigation Measure VIS-2 (Pipeline Crossovers and Expansion Loops)**, which requires reducing the height of either the existing or new pipeline, and the installation of horizontal expansion loops would help obscure views of the pipeline from U.S. Highway 395 so that the pipelines would be less visually evident. Although views of the pipeline would be fleeting due to the speed of travel and Mitigation Measures VIS-1 and VIS-2 would reduce the visibility of the new pipelines, views of parallel pipelines spanning 12 feet wide would dominate the existing environment or surroundings and would therefore meet the "modification" VQO in the short-term and long-term.

Views from SR 203 – KOP 2. The same pipeline segments described above would be visible to motorists traveling either eastbound or westbound on portions of SR 203 near the intersection with U.S. Highway 395. In this area, which has a VQO of "retention", the pipeline would generally parallel SR 203 to the north at distances from about 1,000 to 1,500 feet. The geothermal pipelines, which would generally repeat the straight lines of SR 203 and be low to the ground, could be visible from vehicles on an estimated 1,450-foot section of SR 203 while traveling eastbound, or for about 20 seconds (BLM and Mono County, 2005). The pipelines would also be visible from vehicles on an estimated 1,150-foot segment of the highway while traveling westbound, or for about 16 seconds. Since the new pipelines would be placed north of the existing Basalt Canyon pipeline, it is possible that views of the new geothermal pipelines would be obstructed by the existing pipeline, topography and shrubbery. To reduce the visibility of the pipeline in these areas, ORNI 50, LLC would paint the pipeline to blend with the landscape in accordance with PDM VIS-3. Implementation of PDM LU-1 would also require ORNI 50, LLC to carry out the Project with fewest visual intrusions. No other sections of the Proposed Action pipeline would be visible from any other locations on SR 203. As described above, the physical features of the power plant would not be visible from SR 203 due to topography, distance, and the presence of trees and transmission lines.

Sections of the geothermal pipelines visible in the foreground from the scenic highways would repeat the color of the existing environment and from KOP 2, the new pipeline segments would also generally repeat the line of the roads, power lines, fences and low horizon. However, because portions of the pipelines would be visually evident from SR 203, the pipelines would still be noticeable and would introduce a smooth texture that is not apparent in the existing environment; therefore, views of the pipeline segments from SR 203 would substantially alter the visual landscape and would be inconsistent with the VQO of "retention" prescribed for this portion of the Project area. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)**, which requires planting of native trees and shrub vegetation in front of the proposed pipeline, and **Mitigation Measure VIS-2 (Pipeline Crossovers and Expansion Loops)**, which requires reducing the height of either the existing or new pipeline and the installation of horizontal expansion loops would help obscure views of the pipeline from this scenic roadway. Although the distance from SR 203 and the pipelines, the speed of travel, and Mitigation Measures VIS-1 and VIS-2 would reduce visibility of the new pipeline, views of three parallel pipelines spanning 12 feet wide would visually dominate the existing environment and would therefore meet the "modification" VQO in the short-term and long-term.

Views from Shady Rest Park - KOP 3. The well facility proposed at the eastern end of Shady Rest Park (38-25) would appear similar to existing well facility constructed on drill site 66-25, as shown in Figure 4.18-3. Construction of this new rectilinear facility would substantially alter the visual character of this site as ORNI 50, LLC would clear approximately 2.5 acres of trees and other vegetation for the well site facilities. Fencing would be installed around the well site. Implementation of PDM VIS-4 would require the well site facility is painted a neutral color to blend in with the existing environment. Nonetheless, the introduction of the 10-foot high motor control building would dominate the existing environment and would result in a substantial change as industrial facilities are uncommon in the existing environment. The building would still be visible from the Shady Rest Park parking lot and Sawmill Road (03S25), which is commonly used by hikers, snowmobilers, cross-country skiers, and other recreationists, who typically expect quality views. For these reasons, construction of this well facility would result in an inconsistency with the site's "retention" VQO designation. Implementation of **Mitigation Measure VIS-1 (Landscape Plan)**, which requires planting of native trees and plants, would help screen views of well site 38-25, however, would still not meet "retention" but does meet "modification" VQO in the short-term and long-term. Note that the well would be visually evident to a greater degree in the short-term (vegetation screening would be relatively young) and during winter months (facility color would contrast with snow). In the long-term (after 10 years), the well would be screened to a greater degree. In the summer time, the facility color would be visually consistent with the surrounding vegetated landscape.

Construction

Construction activities and construction-related traffic would be visible from multiple vantage points in the Project area and vicinity throughout the construction period (up to approximately 16 months). Earthmoving activities and construction materials, equipment, trucks, and parked vehicles, could be visible throughout the construction duration, during which a number of activities would take place, including vegetation removal, earthwork, as well as foundation and equipment installation. Motorists traveling along U.S. Highway 395 and Old Highway 395, and Antelope Springs Road (03S05) would have temporary views of construction vehicles traveling to and from the power plant site.

Construction-Related Drilling Effects. During intermittent drilling activities, the periodic use of drill rigs in the wellfield would be visible from U.S. Highway 395, SR 203 and unpaved roads at foreground or middleground distances while drilling from any of the well sites in the Project area. Due to the large size of the approximately 175-foot high drill rigs, use of this particular piece of construction equipment would temporarily alter the existing quality and character of the Project area by introducing a tall structure to the area during drilling activities. Because this construction activity would be short-term (approximately two months per well) and temporary, the drill rig structure would not permanently alter the existing visual quality and character of the Project area. Furthermore, comparable drilling activities have historically occurred in the area, the most recent being the drilling of wells 14-25 and 12-25 in the Upper Basalt Canyon area. Such activities at well 14-25 would have met “partial retention” VQO requirements, though nothing more stringent. During flow testing, geothermal steam and water vapor plumes could also be visible from adjacent roads and the nearby Mammoth Lakes community. Depending on the weather conditions during each flow test, these plumes could rise up to several hundred feet high. Since some of the access roads adjacent to well facility sites would require temporary closure during construction, recreationists would not have close-up views of well testing activities. For this reason, and since flow testing operations would be short-term (limited to a 30-day period at each well site), once these operations are completed, the construction-related effects on views would not be substantial. Similar to existing and past drilling activities that have occurred in the Project area, the effects of construction-related drilling on views would have met “partial retention” VQO requirements, though nothing more stringent.

Nighttime Construction Lighting Effects. Nighttime lighting would be necessary at each well site during drilling and flow-testing activities since these operations would take place 24 hours per day, 7 days per week over 30 days. The light from the drill site would be focused downwards and would unlikely be visible from the Mammoth Lakes community given the distance between the well sites and the community. The dense stands of trees surrounding the well field would also help shield any nighttime lighting effects on the community. For this reason, nighttime construction lighting would not substantially degrade the visual character of the Project area’s landscape. Nonetheless, the introduction of lighting to the Project area would have met “partial retention” VQO requirements, though nothing more stringent.

Pipeline Construction-Related Effects. As described in Chapter 2, pipeline construction would be limited to one summer season and would likely be visible from multiple vantage points. Motorists traveling on SR 203, U.S. Highway 395, Old Highway 395, Antelope Springs Road (03S05), and Sawmill Road (03S25) would have fleeting views of pipeline construction activities, equipment, and vehicles. Although pipeline construction would be short-term and impacts on views would not be adversely affected in the long-term, such activities would result in an inconsistency with the VQO rating, though would have met “partial retention” VQO requirements, but nothing more stringent.

In conclusion, although recreationists and motorists from multiple vantage points may have views of construction vehicles, equipment, and vapor plumes, given the overall short-term duration of construction, such activities would not be visually adverse in the long-term. Construction-related effects would meet the “partial retention” VQO requirements, however would result in an inconsistency with the “retention” VQO rating.

Operation and Maintenance

Effects of the Power Plant Operations and Maintenance. Over the life of the Proposed Action, the new power plant would be operated collectively with the existing Casa Diablo Geothermal Complex and would be operated by six new employees. As described in Chapter 2, it may be necessary to re-drill or rework both production and injection wells periodically over the life of the CD-IV Project. Such activities would be the same as those described above for drilling operations. Portions of the drilling rig mast would likely extend above the top of the forest and would be temporarily visible from some locations along SR 203, the Town of Mammoth Lakes, and possibly from U.S. Highway 395. Given the short-term nature of any necessary drilling and fluid testing activities, impacts on these views would be temporary and would not result in long-term inconsistencies with USFS VQOs, local policy goals or objectives.

Effects of the Power Plant. Because the power plant would be an air-cooled closed-loop binary system, there would be no release of geothermal fluid and no cooling towers that could result in the formation of steam plumes during plant operations. Steam plumes visible in the vicinity of the existing power plants at Casa Diablo emanate from naturally occurring fumaroles in the area. Because the proposed CD-IV power plant would not create any new steam plumes, the Proposed Action would be consistent with the power plant site’s VQO of “retention” in the eastern portion of the Project area.

Access Road Maintenance Effects. Access roads would also need to be maintained during the summer and winter time to ensure adequate access to the production wells year-round. Recreationists using these access roads would have intermittent views of snow plowing equipment and other access road maintenance equipment. Since these activities would be short-term, impacts on recreational views would be temporary and would not result in long-term inconsistencies with USFS VQOs, local policy goals or objectives.

Operational Lighting Effects. Each well site would have onsite lighting for safety purposes, consisting of one single light. The light would be directed downward and shaded to keep the light on the well site. Additional lighting may be required during any well site inspections and maintenance activities. Lighting at the well sites would not be visible from the Town of Mammoth Lakes given the small scale and distance between the well sites and the community. The dense stands of trees surrounding the well field would also shield any operational lighting effects on the community. For this reason, nighttime operational lighting would not substantially degrade the visual character of the Project area’s landscape.

Decommissioning

The expected life of the power plant operation is 30 years. Decommissioning would entail dismantling the power plant and wellfield and abandoning wells. The decommissioning activities would not result in substantial surface disturbance beyond restoration of existing facility footprints, additional removal of vegetation, or involve any other activities which could lead to any substantial visual impacts.

4.18.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.2.2.

a) Have a substantial adverse effect on a scenic vista.

There are no designated scenic vistas in the vicinity of the Project area. The CD-IV Project facilities, construction, operation and maintenance, and decommissioning would remain subordinate to the existing visual setting and would not have a substantial adverse effect on a scenic vista.

b) Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway.

Construction

As described in Section 3.18, *Visual Resources*, U.S. Highway 395 is a State-designated scenic highway and SR 203 is a Mono County-designated scenic route. As described above, motorists traveling on these routes would have temporary views of construction activities, equipment (including drill rigs), and construction-related traffic throughout the approximately 16-month construction duration of the Proposed Action. Refer to Section 4.18.4.1, above, for detailed discussion of construction-related impacts on views from these scenic highways.

Construction of the power plant, belowground transmission line, well pads, and geothermal pipelines would require tree removal. Up to 6.5 acres of trees would be removed for the new power plant but this site is not visible from any scenic routes due to topography and the thick stand of trees surrounding the site. Tree removal for the well pads and the pipeline would vary from site to site. At Project sites adjacent to Shady Rest Park (including well facility 38-25), Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08), the clearance of trees and some road widening would be more noticeable to motorists and recreationists along these roads. Implementation of PDMs VIS-1 through VIS-4, and LU-1 would help reduce the visibility of well facilities and the geothermal pipelines. Although these well sites would still be surrounded by a dense stand of trees, tree removal activities along these roadways could still be perceived as a negative visual impact. As described in Section 4.18.4.1, construction of well facilities, widened roads and geothermal pipelines immediately adjacent to Sawmill Cutoff Road (NFSR 03S08), Sawmill Road (03S25), and Shady Rest Park would also be readily visible and could substantially alter views from these recreational areas. The introduction of the pipeline, pipeline crossings and crossovers would often be clearly visible and would rise above the vegetation from the adjacent roadways, constituting a substantial visual change in the surrounding mountainous landscape. Implementation of the PDMs and **Mitigation Measure VIS-1 (Landscape Plan)** at select Project sites would require planting of native plants and trees to screen well site facilities and the geothermal pipelines from Sawmill Cutoff Road (NFSR 03S08), Sawmill Road (03S25), and Shady Rest Park. This measure would also require immediate and effective landscaping to occur prior to construction at specific Project sites to help screen visual effects of pipeline crossovers and locations where the pipeline would cross beneath roads. Implementation of these mitigation measures would reduce impacts to scenic resources to a less-than–significant level.

Operation and Maintenance

As described earlier, operation activities may require re-drilling or reworking of both production and injection wells periodically as well as maintenance of new access roads. During such activities, recreationists and motorists using local trails and scenic routes would have intermittent views of construction equipment, construction activities, and vehicles. Steam plumes would not be generated by the power plant and thus there would not be any visual effect on scenic resources related to the scenic highways of the area in that regard. Other operations and maintenance activities such as re-drilling and reworking of wells or periodic maintenance of the power plant would be short-term and the impact on scenic resources would be less than significant.

Decommissioning

As described under Section 4.18.4.1, decommissioning activities of the Proposed Action would not substantially degrade scenic resources in the Project area. Therefore, no impact would occur.

c) Substantially degrade the existing visual character or quality of the site and its surroundings.

As described under Section 4.18.4.1 and under the discussion for criterion b), the new power plant would be constructed adjacent to Antelope Springs Road (03S05), requiring removal of approximately 6.5 acres of trees. Views from this roadway would be substantially different from existing forested conditions and the plant would appear similar to the existing power plant shown in Figure 4.18-3. Implementation of PDM VIS-4 would require ORNI 50, LLC to paint the plant a neutral color to blend with the existing environment. However, even with implementation of PDM VIS-4, introducing an industrial element to the existing forested landscape would substantially degrade the visual character and quality of the site, resulting in a significant impact. Implementation of **Mitigation Measure VIS-3 (Power Plant Landscape Plan)**, which requires immediate and effective landscaping improvements in front of the plant, would help screen views of the plant from this roadway and would reduce this impact to a less-than-significant level.

As described under the discussion for criterion b), above, construction and operation and maintenance of all other elements of the Proposed Action (well facilities and pipelines) would be noticeable to motorists and recreationists from multiple vantage points. Views of construction equipment (including large drill rigs), construction vehicles, and tree removal activities would be noticeable throughout the 16-month construction period and could temporarily degrade the existing visual character or quality of the site and its surroundings. As described in Section 4.18.4.1, above, implementation of PDMs and **Mitigation Measures VIS-1 (Landscape Plan)**, and **VIS-2 (Pipeline Crossovers and Expansion Loops)** including the installation of non-vertical expansion loops would help reduce visual impacts of the Proposed Action on the visual character and quality of the site and its surroundings. Nonetheless, even with implementation of these measures, collectively, the three parallel 24-inch pipelines (spanning over a 12 feet wide corridor), the installation of multiple crossovers and the new well facilities would be highly visible along the majority of Sawmill Road (03S25), SR 203 (county designated scenic route) and U.S. Highway 395 (State designated scenic highway). Given the high visual sensitivity of this area, the Proposed Action would still result in a substantial adverse effect on the visual character and quality of the site and its surroundings, resulting in a significant and unavoidable impact.

d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

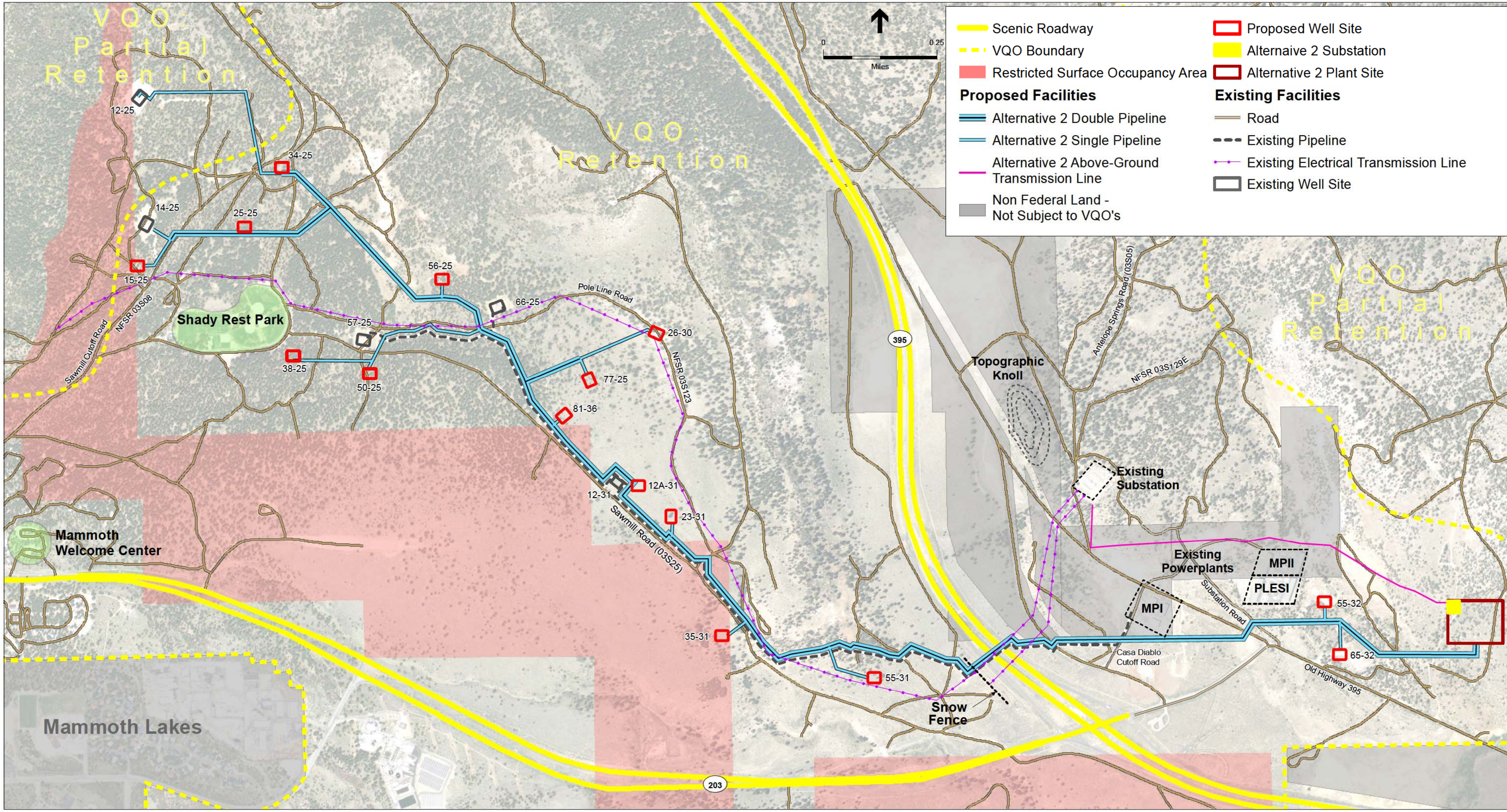
As described under Section 4.18.4.1, nighttime construction lighting would be required for site during drilling and flow-testing activities. Onsite lighting would also be required at the well site facilities and power plant. Since both construction and operational lighting would be focused downwards and given the distance between the well sites and the community, the Proposed Action would not create a substantial light or glare effect.

4.18.5 Alternative 2: Plant Site Alternative

4.18.5.1 Direct and Indirect Impacts

Consistency with USFS Visual Management System and BLM Geothermal Leases CACA-14407 and CACA-14408 "Restricted Surface Occupancy" Stipulation

Under Alternative 2 (presented in Figure 4.18-4), the well site facilities would be the same as those under the Proposed Action. The geothermal pipeline and access road alignments to the west of U.S. Highway 395 would also be the same as those under the Proposed Action. However, unlike the Proposed Action, at locations where a pipeline must cross either the existing pipeline, a production, injection pipeline, or both, the pipeline crossings would be underground. In comparison to the CD-IV Project, installation of the pipeline belowground at crossing points would reduce visual impacts in comparison to the Proposed Action. As determined under Section 4.18.4.1, implementation of PDMs VIS-1, VIS-2, VIS-3, and VIS-4 as well as **Mitigation Measure VIS-1 (Landscape Plan)** would help screen visual effects of new well facilities and pipeline at sites where these facilities would be clearly visible from trails, NFSRs, SR 203 and U.S. Highway 395. Similar to Alternative 1, these measures would help reduce the visual effects of these facilities but would not ensure consistency with the VQOs of "retention" and "partial retention" throughout the portion of the Project area west of U.S. Highway 395. East of U.S. Highway 395, the pipelines would parallel the existing Basalt Canyon pipeline, pass the existing power plants, and connect the easternmost well facilities to the Alternative 2 plant site. The Alternative 2 pipeline alignment east of U.S. Highway 395 would be visible within Forest Service lands, from old Highway 395 and would be unable to meet the VQO requirements for "retention" in this area.



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

Casa Diablo IV Geothermal Development Project . 209487

Figure 4.18-4

USFS Visual Quality Objectives for Alternative 2

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Under Alternative 2, the power plant and substation would be located approximately 0.4 mile east of the existing Casa Diablo power plant facilities (MP-II and PLES I), and east of proposed injection wells 55-32 and 65-32. Figure 3.18-2, Photo 2, shows a representative view of the power plant site under Alternative 2. Similar to that proposed under Alternative 1, the Alternative 2 power plant would also be screened by stands of Jeffrey Pine trees. However, unlike the power plant site proposed under Alternative 1, the Alternative 2 power plant site would be constructed at a similar elevation as the existing power plant facilities (MP-II and PLES I) and could be partially visible as shown in Figure 4.18-2, Photo 2. Implementation of PDM VIS-4 would ensure that the power plant is painted a neutral color (similar to the other CD-IV facilities) to blend in with the environment. Similar to the Proposed Action, introducing the new power plant at this alternative site would result in an inconsistency with the VQO of "retention" in this portion of the Project area. Similar to the Proposed Action and as shown in Figure 4.18-4, the western edge of well facilities 14-25 and 15-25 are within those portions of Geothermal Leases CACA-14407 and CACA-14408 covered by the "Restricted Surface Occupancy" stipulations. In addition, two segments of the pipeline, one near well site 81-36 and the other between well sites 23-31 and 35-31, fall within a portion of Geothermal Lease CACA-14408 covered by the "no surface occupancy" stipulation. Implementation of **Mitigation Measure VIS-1** would help screen views of the wells and pipelines from Sawmill Cutoff Road (NFSR 03S08) and Sawmill Road. Implementation of **Mitigation Measure VIS 1** would reduce the impact to a less than significant level.

Construction, Operations and Maintenance, and Decommissioning

Potential visual resources impacts during construction, operation and decommissioning of Alternative 2 would be similar to those described for the Proposed Action. Under this alternative, motorists traveling along Old Highway 395 would have fleeting views of both construction- and operation-related vehicles traveling to and from the alternative plant site. Given the overall short-term duration of construction, operation, and decommissioning activities, Alternative 2 would not substantially degrade the visual character of the Project area's landscape. With the exception of well facilities 15-25, 34-25, and 38-25, the site would maintain VQO ratings of "partial retention." Similar to Alternative 1, there would be no steam plumes generated by the Alternative 2 Plant so there would be no degradation in the overall visual quality of the site and it would retain a minimum VQO of "partial retention," but not "retention" within the eastern portion of the Project area.

4.18.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Implementation of PDMs VIS-1 through VIS-4, and LU-1 and **Mitigation Measure VIS-1 (Landscape Plan)** would help reduce the visibility of well site facilities, geothermal pipelines, and the power plant. Although the installation of pipeline crossings belowground would reduce adverse visual effect, the three parallel 24-inch pipelines (spanning approximately 12 feet wide) and the new well facilities would be highly visible along the majority of Sawmill Road (03S25), SR 203 (county designated scenic route) and U.S Highway 395 (State designated scenic highway). Given the high visual sensitivity of this area, Alternative 2 would still result in a substantial adverse effect on the visual character and quality of the site and its surroundings, resulting in a significant and unavoidable impact.

4.18.6 Alternative 3: Modified Pipeline Alternative

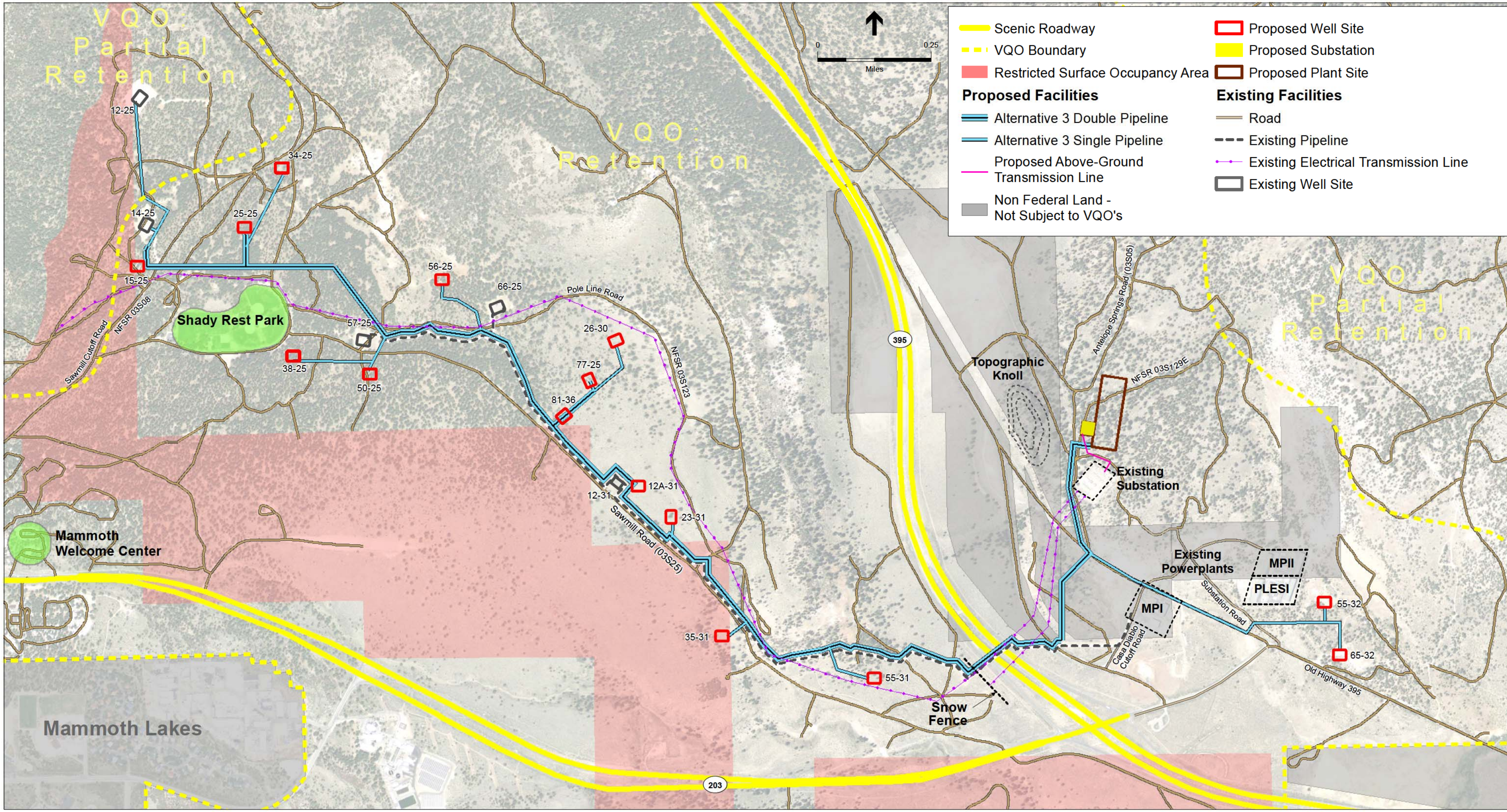
4.18.6.1 Direct and Indirect Impacts

Consistency with USFS Visual Management System and BLM Geothermal Leases CACA-14407 and CACA-14408 "No Surface Occupancy" Stipulation

Under Alternative 3 (presented in Figure 4.18-5), the power plant and well facilities would be the same as those under the Proposed Action. As described in Section 2.4.2 of Chapter 2, *Proposed Action and Alternatives*, well construction would be phased to proceed east to west and not all wells may be needed. Wells in the western portion of Basalt Canyon and closest to Shady Rest Park would be the last wells to be developed. As determined under Section 4.18.4.1, implementation of PDMs VIS-1through VIS-4, and LU-1, and **Mitigation Measure VIS-1 (Landscape Plan)** would help screen visual effects of the well facilities where these facilities would be clearly visible from trails, Sawmill Road (03S25), Sawmill Cutoff Road (NFSR 03S08), and scenic roadways. Mitigation Measure VIS-1 would ensure that the landscape plan gets implemented prior to construction to ensure that newly vegetated areas have a chance to mature prior to construction of applicable well facilities. Similar to Alternative 1, these measures help reduce the visual effects of these facilities but would not ensure consistency with the VQOs of "retention" and "partial retention" throughout the portion of the Project area west of U.S. Highway 395.

Under Alternative 3, the geothermal production and injection pipelines would be constructed in conjunction with the well drilling and would be phased. Unlike Alternative 1, the production pipeline from well facility 26-30 and well 77-25 would be moved to the south, connecting near well facility site 81-36. In Upper Basalt Canyon, the production pipeline from well facility site 12-25 would proceed south towards well facility 14-25 and 15-25, rather than east and south to well site 34-25. Furthermore, the production and injection pipeline corridor would be narrowed to the east of Sawmill Road (03S25) and well facility site 81-36. As described in Section 2.4.3.2, if the two injection wells 55-32 and 65-32 are sufficient for reinjection of spent geothermal brine, the injection pipeline to Basalt Canyon would not be constructed. Consequently, wells and reinjection pipeline in the western portion of the Project area may not be needed. Under this scenario, construction of geothermal piping would be less and impacts on visual resources associated with the pipeline development would be substantially lower. Specifically, under Alternative 3, less geothermal piping would be constructed parallel to Sawmill Cutoff Road (NFSR 03S08) in comparison to the Proposed Action. In addition, at locations where a new pipeline must cross the existing pipeline, a production pipeline, or both, the pipeline crossings would be underground. In comparison to the Proposed Action, installation of new pipeline belowground at specific pipeline crossings would reduce visual impacts. Implementation of PDMs VIS-1 through VIS-4, and LU-1 as well as **Mitigation Measure VIS-1 (Landscape Plan)** would help screen visual effects of the pipelines at sites where these facilities would be clearly visible from trails, NFSRs, SR 203 and U.S. Highway 395.

This measure would also help screen visual effects of pipeline crossovers and locations where the pipeline would cross beneath roads. Implementation of these measures would reduce visual effects of visible portions of the geothermal pipeline but would still result in an inconsistency with the VQO of "retention" along Sawmill Road (03S25) and Sawmill Cutoff Road (NFSR 03S08).



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

Figure 4.18-5
USFS Visual Quality Objectives for Alternative 3

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Similar to the Proposed Action and as shown in Figure 4.18-5, the western edge of well facilities 14-25 and 15-25 are within those portions of Geothermal Leases CACA-14407 and CACA-14408 covered by the "no surface occupancy" stipulations. In addition, two segments of the pipeline, one near well site 81-36 and the other between well sites 23-31 and 35-31, fall within a portion of Geothermal Lease CACA-14408 covered by the "No Surface Occupancy" stipulation. Implementation of **Mitigation Measure VIS-1** would help screen views of the wells and pipelines from Sawmill Cutoff Road and Sawmill Road.

Construction, Operation and Maintenance, and Decommissioning

Potential visual resources impacts during construction, operation and maintenance, and decommissioning of Alternative 3 would be similar to those described for the Proposed Action. Given the overall short-term duration of construction, operation and maintenance, and decommissioning activities, Alternative 3 would not substantially degrade the visual character of the Project area's landscape and the site would retain consistency with VQO requirements of "partial retention," though nothing more stringent.

4.18.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for Alternative 1 (the Proposed Action). Implementation of PDMs VIS-1 through VIS-4, and LU-1 would reduce the visibility of well site facilities, geothermal pipelines, and the power plant. Similar to Alternative 1, implementation of **Mitigation Measure VIS-3 (Power Plant Landscape Plan)** would help screen views of the power plant from Antelope Springs Road (03S05). **Mitigation Measure VIS-1 (Landscape Plan)** would also be required to help screen visual effects of the pipelines and well facilities but, in comparison to Alternative 1, would be needed at fewer locations where these facilities would be clearly visible from trails, NFSRs, SR 203 and U.S. Highway 395. Although the installation of pipeline crossings belowground would reduce adverse visual effects, the three parallel 24-inch pipelines (spanning approximately 12 feet wide) and the new well facilities would be highly visible along the majority of Sawmill Road (03S25), SR 203 (county designated scenic route) and U.S. Highway 395 (State designated scenic highway). Given the high visual sensitivity of this area, Alternative 3 would still result in a substantial adverse effect on the visual character and quality of the site and its surroundings, resulting in a significant and unavoidable impact.

4.18.7 Alternative 4: No Action

4.18.7.1 Direct and Indirect Impacts

Consistency with USFS Visual Management System and BLM Geothermal Leases CACA-14407 and CACA-14408 "No Surface Occupancy" Stipulation

Under this alternative, the BLM would not approve the CD-IV Project. Direct and indirect impacts related to the construction, operation and maintenance, and decommissioning of the Project would not occur.

If the No Action Alternative were implemented, few changes would be implemented on the site and the existing environmental setting described in Draft EIS/EIR Chapter 3 would generally be maintained.

However, 11 exploratory wells already permitted which could still be drilled, not part of the CD-IV Project. These exploratory wells have already been evaluated in other environmental documents including the EA for the *Basalt Canyon Slim Hole and Geothermal Well Exploration Projects* (BLM, 2001) and the EA for the *Upper Basalt Geothermal Exploration Project* (BLM, 2005). Temporary drill rigs would be evident and some vegetation removal and well spoils would also be evident. The wells with the most visual exposure, wells 15-25, 34-25 and 38-25 (next to Shady Rest Park), were evaluated in the Upper Basalt Geothermal Exploration and with implementation of appropriate mitigation measures, visual impacts would be reduced, however, would still not meet “retention” but does meet “partial retention” VQO.

4.18.7.2 CEQA Significance Determination

Under the No Action Alternative no facilities associated with the CD-IV Project would be constructed and therefore, the Project would not result in changes to existing visual resource conditions.

However, exploration well drilling at 11 sites which have already been permitted at the same locations but are not part of this CD-IV Project could occur. Three of the sites are visually exposed and drilling would result in minor impacts to visual resources that would be less than significant.

4.18.8 Cumulative Impacts

4.18.8.1 Geographic Extent/Context

The geographic scope of the cumulative effects analysis for recreation includes the northeastern portion of the Mammoth Lakes region of Inyo National Forest. This geographic scope was established based on the boundaries of the affected recreation resources, which includes NFSRs that serve and/or connect to other portions of the Mammoth Lakes region of Inyo National Park.

4.18.8.2 Existing Cumulative Conditions

Existing conditions within the cumulative impacts area reflect a combination of the natural condition and the effects of past actions and are described in Chapter 3. Direct and indirect visual effects of the construction, operation and maintenance, and closure and decommissioning of the CD-IV Project are analyzed above. The Project area consists of relatively rural and forested land, administered primarily by the USFS as part of the Inyo National Forest in unincorporated Mono County. Existing geothermal power plants, pipelines, and ancillary facilities are located in the Project area and are visible from multiple vantage points including SR 203, U.S. Highway 395, and Sawmill Cutoff Road (NFSR 03S08) and Sawmill Road (03S25).

4.18.8.3 Reasonably Foreseeable Projects

Projects identified on the cumulative projects list on Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, that could result in cumulative visual resources impacts include the Digital 395 Middle Mile Project and various Town of Mammoth Lakes capital improvement projects including airport security upgrades, sidewalk improvement projects, road and storm drainage improvements, and various bike path improvement projects as part of the Town's Trail System Master Plan. Construction of the MP-I Replacement project is expected to be complete by the end of 2012 but due to delays, could overlap with construction of the Proposed Action.

4.18.8.4 Construction

The construction schedule for the Proposed Action would begin in the spring of 2013 and continue until December 2013. Construction would also occur during the non-winter months of 2014, and potentially 2015. Past, current, and future projects could require construction activities that use the same access routes as the Proposed Action. As shown in Table 4.1-1, future projects that could overlap in schedule with the Proposed Action include the Digital 395 Middle Mile Project, various roadway rehabilitation projects in Mammoth Lakes, and parks and recreation projects in Mammoth Lakes. Although the volume of construction vehicles traveling on the same access could be noticeable, most of these projects would be short-term and would occur at least one mile away from the Proposed Action. Therefore, the projects listed in Table 4.1-1 are not expected to result in substantial adverse effects on scenic resources, visual character, or quality of the Project site and surrounding area. However, as noted in the paragraph above, the MP-I Replacement Project could potentially overlap in construction of the Proposed Action. In the event that construction of the proposed power plant overlaps in construction with the MP-1 Replacement Project, the volume of construction vehicles and construction equipment would be noticeable from U.S. Highway 395 and SR 203 but the effects would be short-term and limited to the period of schedule overlap. Implementation of **Mitigation Measures VIS-1** (Landscape Plan), **and VIS-3** (Power Plant Landscape Plan) would adequately reduce Proposed Action-related construction effects on scenic resources, the visual character, and/or quality of the CD-IV Project. The construction effects of the Proposed Action, when combined with the other cumulative projects identified above, would not be visually adverse and would be consistent with the VQOs of "partial retention" but would not meet the criteria set for "retention" in the Project area.

4.18.8.5 Operation, Maintenance, and Decommissioning

The increase in development associated with cumulative projects would be expected to result in an increase in residents and workers – as well as visitors, shoppers, and tourists – to the Town of Mammoth, who would collectively be expected to increase the use of trails and scenic roads in the region and would expect quality views from these vantage points. However, the Town of Mammoth and Inyo National Forest includes extensive outdoor opportunities for scenic viewing. The majority of the cumulative projects listed in Table 4.1-1 would occur within the limits of the Town of Mammoth Lakes and would not overlap in area with the Proposed Action. Similar to the Proposed Action, operation of the replaced MP-I would not generate steam plumes.

Consequently, the effects of the Proposed Action during operation, maintenance, and decommissioning, when combined with the other cumulative projects identified above, would not be visually adverse and would be consistent with the VQOs of “partial retention” but would not meet the criteria set for “retention” in the Project area.

However, as described in Section 4.18.4.1, the installation of various Project components would result in inconsistencies with VQOs of “partial retention” and “retention” at different times of the year and would vary between the short-term and long-term. For example, the proposed power plant would meet the “maximum modification” VQO criteria in the short-term and during winter months. In the long-term (i.e., 10 years after construction), once screening vegetation has matured, and in summer months when the facility blends in with the surrounding vegetation, the plant would meet the “partial retention” VQO criteria.

4.18.8.6 CEQA Significance Determinations

CEQA cumulative impacts would be the same as described above and would not have a cumulatively considerable contribution to impacts on visual resources and therefore the impact would be less than significant.

4.18.9 Mitigation Measures

The following measures would be required to avoid or reduce impacts on the quality of the human environment. The following mitigation measures would avoid or minimize impacts on visual resources:

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. The landscape plan shall be coordinated with the revegetation plan (refer to **Mitigation Measure VEG-1**) including a monitoring and reporting plan. Permanent fencing shall be precluded to reduce potential barriers to wildlife. To minimize adverse visual effects from the abovementioned roads and park, ORNI 50, LLC shall landscape the following areas such that direct views and corners of the well facilities and pipeline are at least 65% obstructed from any location within a ten-year period. Monitoring at the end of the third growing season shall be conducted to determine if success standards are being met. If it is determined that success standards are not being met, ORNI 50, LLC shall take immediate action to re-implement the Landscape Plan to ensure compliance by the tenth-year period. At the following sites, ORNI 50, LLC shall also 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 (NFSR 03S123) (near well facility sites 56-25,66-25, 77-25, 81-36, 12A-31, 23-31, 35-31, and 55-31)

Once the locations of proposed crossovers and expansion loops are determined, the need for implementing this measure will be determined.

Mitigation Measure VIS-2: Pipeline Crossovers and Expansion Loops. At locations where one pipeline crosses over another adjacent to Sawmill Road (03S25) and Pole Line Road (NFSR 03S123) (near well facility sites 56-25,66-25, 77-25, 81-36, 12A-31, 23-31, 35-31, and 55-31) and where the terrain is not a constraining factor, ORNI 50, LLC shall reduce the height of crossovers and expansion loops by:

a. Lowering the existing pipeline or new pipeline (whichever is easiest) belowground or within a 3-foot deep trench and design the pipeline crossover with pairs of 30, 45 or 90 degree ells to ensure that the overall height of the crossover is at or below 5.5 feet aboveground.

b. All expansion loops shall be horizontal to minimize overall height of installed pipelines to less than 5.5 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 (03S05). The landscape plan shall be coordinated with the revegetation plan (refer to **Mitigation Measure VEG-1**) including a monitoring and reporting plan. ORNI50, LLC shall landscape the area immediately adjacent to Antelope Springs Road and at select locations such that direct views and corners of the power plant are at least 65% obstructed from any location within a ten-year period. Monitoring shall be conducted at the end of the fifth growing season to determine whether success standards are being met. If it is determined that success standards are not being met, ORNI 50, LLC shall take immediate action to re-implement the Landscape Plan to ensure compliance by the tenth-year period.

4.18.10 Residual Impacts after Mitigation Incorporated

Following implementation of mitigation measures provided in Section 4.18.9, many adverse effects on visual resources resulting from construction, operation and maintenance, of the Proposed Action and alternatives would be avoided or substantially reduced. However, there would continue to be a residual substantial and significant unavoidable visual impact 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. Following decommissioning, these significant and unavoidable residual impacts on visual resources would be eliminated.

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4.19 Water Resources

4.19.1 Methodology for Analysis

This analysis of potential environmental consequences of the Proposed Action and Alternatives focuses on the following indicators: surface water quality related to accidental releases, changes in drainage patterns and associated hydrology, potential for flooding, and use of shallow groundwater for Project construction and operation. The impact analysis provided here evaluates potential impacts based on these indicators, considers PDMs and compliance with applicable regulations, and applies mitigation measures to minimize remaining potential impacts that could occur as a result of implementation of the Proposed Action.

Potential for groundwater effects related to geothermal reservoir development is addressed separately in Section 4.7, *Geothermal and Groundwater Resources*. Water supply availability with respect to the Proposed Action is evaluated in Section 4.17, *Utilities and Public Services*. For a discussion of potential effects on riparian habitat, including applicability of USFS Riparian Conservation Objectives, please refer to Section 4.3, *Biological Resources – Vegetation*.

4.19.2 Project Design Measures

The analysis assumes that the following PDMs related to hydrologic resources would be fully implemented:

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*: 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*: Ormat 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.

4.19.3 CEQA Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to hydrology and water quality if it would:

a) Violate any water quality standards or waste discharge requirements?

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

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

f) Otherwise substantially degrade water quality?

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

j) Inundation by seiche, tsunami, or mudflow?

4.19.4 Alternative 1: Proposed Action

4.19.4.1 Direct and Indirect Impacts

This analysis of direct and indirect impacts for the Proposed Action is organized according to the following project phases: construction; operation and maintenance; and decommissioning.

Surface Water Quality

Construction

Select elements of the Proposed Action would be located in areas that are tributary to Hot Creek. As shown in Figure 3.19-1 (in Chapter 3.19, Water Resources), these include the two well sites located east of U.S. Highway 395, the proposed plant site, and associated pipelines located east of U.S. Highway 395. Wells 55-32 and 65-32, as well as a proposed access road associated with Well 55-32, would be located at least 1,100 feet east of the nearest tributary waterway. The proposed plant site would be located approximately 1,200 feet northeast of the nearest tributary waterway. Generally, these facilities would be located at a sufficient distance from existing waterways that leaks would be contained or shut off prior to leaked fluids reaching surface waters. The pipelines connecting wells 55-32 and 65-32 to the remainder of the pipeline network would span the tributary waterway in the vicinity of the existing plant site, as shown in Figure 3.19-1. All other proposed facilities are located in areas that drain into swales, located to the west of U.S. Highway 395, including all proposed wells, pipelines, and access roads within that area (Figure 3.19-1).

Implementation of the Proposed Action would include various construction activities that would include trenching, grading, installation of pipelines, installation of buildings and other facilities, construction of roads, modification or closure of existing roads, and installation of various appurtenances. Construction of these facilities would require the use of a variety of different types of heavy machinery such as scrapers, bulldozers, graders, earth movers, heavy trucks, transport vehicles, trenchers, excavators, drilling rigs, and a variety of other equipment on-site. Construction activities would include removal of existing vegetation and disturbance of surface sediments, as well as grading, trenching, and various other activities. These activities, as well as additional wear on existing unpaved access roads, could contribute to increased erosion and downstream sedimentation potential. Increased loads of sediment and construction-related water quality pollutants including oils, greases, fuels, hydraulic fluid, paints, cement washout, and various other constituents could be released into the environment during construction. During a storm event, these pollutants could become entrained in stormwater and flow offsite, resulting in degradation of water quality downstream.

The Applicant has proposed several measures that, when combined with required water quality permitting for the construction period, would help to minimize potential impacts associated with grading, the use of heavy machinery, and other construction related sources of water quality emissions. PDMs HYD-1, HYD-3, HYD-5, HYD-6, and HYD-7 would ensure that grading is minimized along the proposed pipeline route, that new roads are maintained to minimize erosion, that stormwater generated offsite would be intercepted and channeled around well sites to minimize erosion, and that the Proposed Action would acquire coverage under the Statewide General Construction Permit for Stormwater Discharges. The latter would include implementation of construction period best management practices (BMPs) and other measures designed to minimize potential for release of water quality pollutants from the Project area during construction, to the extent needed to protect downstream beneficial uses. BMPs to be implemented would be determined prior to the initiation of construction activities on site, based on LRWQCB requirements. Additionally, for areas located on USFS lands, implementation of applicable BMPs included in the USFS Water Quality Management Handbook would be required. In order to ensure that existing and modified roads would also be adequately maintained to prevent erosion and sedimentation, implementation of **Mitigation Measure SW-1** would be required. This measure provides specific requirements for the implementation of a Comprehensive Site Drainage and Runoff Management Plan, and ensures that existing and modified roads, including roads plowed during the winter for Project operations, would be managed for erosion and sedimentation potential. No further mitigation is warranted. For a discussion of potential water quality impacts specific to well drilling, please refer to the discussion of geothermal well construction and testing, below.

Well construction (production and injection wells) would involve drilling and installation of geothermal wells, as discussed in Chapter 2, Proposed Action and Alternatives. Well drilling activities would result in the surfacing of drilling mud, drill cuttings, and water/geothermal fluid. In the event that drill cuttings, drilling mud, water/geothermal fluid, and/or additives are accidentally released from the drilling site, water quality of natural waters could be affected. The Proposed Action would include several measures and activities designed to minimize potential for release of these potential water quality pollutants from the well construction sites. Drilling mud and associated liquids would be contained on-site, and would be reinjected by the drilling rig in support of the ongoing drilling process. As discussed in Chapter 2, drill cuttings would be separated from the drilling mud and contained on-site. In accordance with PDM HYD-9, containment basins/sumps would be constructed at each drill site. These facilities would be used for the containment and temporary storage of all drilling fluid, drilling mud, and drill cuttings, as stipulated in PDM HYD-9. Stormwater at the drilling site would also be routed into these containment basins/sumps. Accidental release of water from the containment basins/sumps during a storm event, such as due to overflowing of a containment basin/sump, could result in an increase in sediment loading and other pollutants downstream. In order to protect downstream waters from increased pollutant loads, implementation of **Mitigation Measure SW-1** would be required. This measure would minimize potential impacts by providing specific requirements for completion and implementation of a comprehensive Site Drainage and Runoff Management Plan, including measures to manage stormwater runoff, minimize erosion and sedimentation potential, and ensure proper sizing of stormwater management facilities.

The Applicant has proposed to apply for coverage under the Statewide General Waste Discharge Requirements (WDRs) for Discharges to Land with a Low Threat to Water Quality (Low Threat WDRs), in order to dispose of drill cuttings on-site. Adherence to the conditions of this permit would be required by law, and would involve testing of the drill cuttings for potential water quality contaminants and other measures required by the LRWQCB designed to minimize potential effects on water quality and ensure that beneficial use of natural waters is not affected. In the event that the remaining drill cuttings are found to contain potential water quality pollutants or other hazardous materials, such that acquisition of coverage under the Low Threat WDRs is not attainable, implementation of **Mitigation Measure SW-2** would be required in order to ensure that surface and groundwater quality would be protected from degradation. This measure would minimize potential effects on water quality by ensuring that all containment facilities for drilling spoils would be protected from flows anticipated from a 100-year flood event with sufficient freeboard to prevent overtopping.

As discussed in Chapter 2, well construction would also involve a series of well flow tests and data collection. Geothermal fluid would be extracted from the wells during the tests and stored in on-site, temporary steel tanks. Following the testing period, the geothermal fluid would be re-injected into the formation, either at the site of the well being tested, or at a separate geothermal well to be determined by the Applicant. Geothermal fluid is generally expected to contain relatively high levels of dissolved solids and minerals, such that accidental release of the fluid to surface waters could result in degradation of water quality. Release of geothermal fluid to the surface or to surface waters is not anticipated. However, accidental release could occur, including potential well blowout during construction, which could result in degradation of water quality downstream. In order to ensure that accidental releases of geothermal fluids would not result in a reduction in downstream water quality, implementation of **Mitigation Measures SW-3** and **PHS-1** (refer to Section 4.13, *Public Health and Safety, Hazardous Materials, and Fire*) would be required. These measures would provide for the proper removal of drilling spoils from each well site in accordance with applicable laws, if coverage under a General Permit could not be acquired, and also requires the preparation of emergency and contingency plans for management of hazardous materials.

Operation and Maintenance

During operation of the Proposed Action, all geothermal fluid would be contained within the proposed infrastructure, and would circulate through production wells/wellheads, pipelines, the power plant facility, and injection pipelines/wells under pressure. Release of geothermal fluid would not occur during normal operations and maintenance. However, accidental release of geothermal fluid could occur in the event of equipment failure. Equipment failure could potentially occur at production and injection well sites, along geothermal pipelines, or at the proposed power plant. Geothermal fluid is generally expected to contain relatively high levels of dissolved solids and minerals, such that accidental release of the fluid to surface waters could result in degradation of water quality. In the event that equipment failure resulted in the discharge of geothermal fluid into the environment, a loss of water quality in receiving waters could occur.

As noted previously, Wells 55-32 and 65-32 would be located at least 1,100 feet from the nearest waterway, while the proposed plant site would be located at least 1,200 feet from the nearest waterway. It is unlikely that leaks at Wells 55-32 or 65-32, or at the plant site, would reach the tributary to Hot Creek. However, in the event of a major leak (such that leaked fluid would flow offsite), potential surface water quality degradation could occur. Additionally, a pipeline leak in the vicinity of the proposed stream crossing could result in potential water quality degradation downstream, including along Hot Creek. Other facilities would be located in areas that drain to internally-drained basins.[1]

Power plant operation would involve geothermal power generation based on binary technology. A binary geothermal plant functions by transferring heat contained in geothermal fluid to an organically-based working fluid, which is used to drive a turbine for power production. The Applicant would use n-pentane, a hydrocarbon, as a working fluid within the proposed power plant. Under atmospheric pressures, N-pentane exists as a liquid up to a temperature of about 95 degrees F. As a result, accidental releases of n-pentane from the power plant could, if sufficient in volume and left uncontained, become entrained in natural waters downstream of the plant, causing water quality pollution. Infiltration of n-pentane into the subsurface could result in groundwater pollution, which could affect shallow groundwater. Additionally, accidental release of transformer oil, fuels, lubricants, and other chemicals into the environment, from the proposed substation, power plant, and other relevant facilities, could become entrained in stormwater and result in degradation of natural waters. Compliance with hazardous materials storage regulations and PDMs (discussed further in Section 4.13, *Public Health and Safety, Hazardous Materials and Fire*) would reduce the potential for accidental releases of hazardous materials and provide measures for the containment and prompt cleanup should they occur.

As discussed in Chapter 2, the Applicant has proposed several measures designed to minimize potential for the accidental release of geothermal fluid. Pressure sensors would be installed along the geothermal fluid pipelines, in order to detect a possible line rupture, with flow control valves that could be used to isolate a rupture once detected. Additionally, PDMs HYD-10, HYD-11, HYD-12, and HYD-13 would address potential geothermal fluid spills by requiring isolation valves to prevent backflow along the geothermal pipelines, requiring containment of spills at the power plant site, installing in-line sensing equipment and automatic shutdown controls in the event of sudden pressure drops or electric failures, and implementation of a Spill or Discharge

[1] Internally drained waterways are not connected to downstream waterways, and therefore do not affect or contribute to downstream water quality. Instead, water within these areas drains into nearby basins, where it evaporates or infiltrates.

Contingency Plan and a Well Blowout Contingency Plan. In addition to these measures, implementation of **Mitigation Measures SW-4** and **SW-5** would be required. Adherence to these measures would minimize accidental release of geothermal fluid by containing all well testing related storage tanks and piping within sufficiently sized containment structure, and would ensure that spill containment facilities are designed to prevent infiltration of spilled fluids to underlying groundwater. These measures would ensure that potential for water quality degradation would be minimized.

During Project operations, unless carefully maintained, equipment used on site, including stationary and non-stationary equipment, trucks, and machinery, could generate fuel, oil, or other fluid leaks. Fluids leaked from equipment could become entrained in stormwater during runoff events, resulting in elevated levels of water quality pollution downstream. In order to minimize this potential impact, implementation of **Mitigation Measure SW-6** would be required. This measure would provide for the routine inspection of equipment and vehicles for fluid leaks, would provide for the routine maintenance of equipment and vehicles to prevent leaks, and would provide for removal and proper disposal of soil contaminated with leaked fluids.

Decommissioning

Potential water quality impacts associated with decommissioning are anticipated to be similar in nature to those discussed for construction activities, although considerably reduced in intensity. Geothermal wells would be required to be abandoned and plugged in accordance with state requirements for the protection of groundwater resources from water quality contamination. Fluid would be removed from pipelines and they would be removed and recycled, as discussed in Chapter 2, Proposed Action and Alternatives. Removal of other facilities would require the use of heavy machinery, which could alter localized drainage patterns, resulting in increases in erosion and sedimentation. However, completion of a reclamation plan would be required prior to initiation of the decommissioning process, and decommissioning activities would be required to adhere to the requirements of the reclamation plan. The reclamation plan would require implementation of grading practices and water quality best management practices designed to minimize potential effects on surface water hydrology and water quality associated with the decommissioning process. Therefore, potential water quality impacts associated with decommissioning would be minimized via adherence to the requirements of the decommissioning plan. No further mitigation is warranted.

Surface Water Hydrology

Construction and Operation

Installation of the proposed facilities, including the construction activities required for their installation, would involve grading, trenching, and/or other earthwork for the proposed power plant, well pads, roads, substation, transmission line, access roads, and the proposed pipeline alignments. These activities could result in changes to on-site topography, which could result in altered drainage patterns on site. For instance, unless carefully managed, proposed on-site grading and trenching activities could result in localized changes in runoff flow direction, flow concentration, or other changes, that could potentially result in increased ponding or flooding on-site or downstream, and/or contributing to increased erosion or sediment loading on-site or downstream.

Installation of the proposed facilities would also involve the construction of new impervious surfaces. Impervious surfaces prevent the infiltration of stormwater into the subsurface, resulting in increased runoff rates during storm events. The Proposed Action would result in the construction of new impervious surfaces associated with the proposed power plant, substation, and, potentially, production well access roads. Increased runoff from proposed impervious surfaces in these areas could cause or contribute to on-site or downstream flooding or other changes in surface hydrology during storm events.

PDM HYD-5 would result in the preparation of a site-specific Drainage and Runoff Management Plan that would apply to all new roads, and would ensure that off-site stormwater would be intercepted in ditches and channeled around well sites so as to minimize on-site increases in ponding, flooding, or erosion. However, changes in drainage patterns and increased impervious surface area would also be expected at the site of other proposed facilities. Additionally, PDM HYD-5 does not apply to existing roads and modified roads. Therefore, in order to minimize potential impacts to existing drainage patterns and stormwater runoff, implementation of **Mitigation Measure SW-1** would be required. This mitigation measure provides additional guidance and requirements for implementation of the Site Drainage and Runoff Management Plan including management of stormwater as affected by impervious surfaces, and requires that the plan be applied to existing as well as new roads and modified roads within the Project area.

Decommissioning

Removal of facilities during decommissioning could result in unanticipated ponding of stormwater or other on-site drainage and erosion/sedimentation issues. In order to minimize such effects and to prevent effects on downstream hydrology, implementation of **Mitigation Measure SW-1**, which provides additional details regarding implementation of a Site Drainage and Runoff Management Plan, would be required. Additional measures may be required through the decommissioning reclamation plan process. With respect to impervious surfaces, decommissioning would remove all impervious surfaces installed under the Proposed Action.

Flooding

Construction, Operation and Maintenance, and Decommissioning

As shown on Figure 3.19-1, the Project area is located entirely outside of the FEMA-defined 100-year flood zone. Therefore the Proposed Action would not result in construction within a floodplain, nor would it otherwise interfere with flooding processes located within a 100-year floodplain during construction, operation and maintenance, or decommissioning. Please refer to prior discussions of on-site hydrology and drainage for a discussion of potential changes in stormwater flows emanating from the Project area.

Groundwater Supply and Groundwater Levels

Construction and Operation

As discussed in Chapter 2, during well construction, up to 25,000 gallons per day of water would be required for construction and well drilling. If all wells were installed, this would represent approximately 21 million gallons (64 acre-feet) over the entire construction period. Water would be optionally sourced from shallow groundwater wells at the existing Casa Diablo geothermal plants, from deep geothermal water (obtained by diverting a small stream of geothermal injection fluid), from reclaimed water available from the MCWD treatment plant, from local MCWD municipal supplies if available, or some combination of these sources. Reducing injection rates of geothermal fluid for existing geothermal plant operation by up to 25,000 gallons per day would represent a relatively small reduction in the total volume of water returned to the geothermal system via injection under existing conditions. The existing Casa Diablo power plants have an average flow rate of 12,000 gallons per minute (17.3 million gallons per day) (EGS, 2012). Similarly, withdrawal of this volume of water the shallow (cold) aquifers would represent a small fraction of the total volume of water available in the affected aquifer, which stores an estimated 180,000 to 300,000 acre-feet of water (see additional discussion in Chapter 3.19, Water Resources). Thus, potential construction withdrawals would be equivalent to 0.02 percent or less of total groundwater storage. Withdrawal of water at these rates is not expected to noticeably affect or alter cold groundwater levels (shallow aquifers). No mitigation is warranted for construction period groundwater withdrawal.

The Proposed Action would not require any groundwater withdrawals from the cold, shallow aquifer during operations, for potable or other uses. Therefore, cold groundwater resources would not be affected by groundwater withdrawals during operation of the Proposed Action. If needed, potable water would be delivered from an alternate source by truck. With respect to cooling, the proposed cooling system would be dry cooled and would not require additional water for cooling.

For a discussion of groundwater resources with respect to operation period utilization of geothermal fluid from deep geothermal aquifers, and associated effects on groundwater, please refer to Chapter 4.7, Geothermal and Groundwater Resources.

Decommissioning

Decommissioning could require groundwater use in support of on-site construction activities, in particular for dust control during decommissioning activities. The groundwater requirements for decommissioning would be substantially lower than those discussed for construction, due to a lower construction work intensity construction and the absence of well drilling. Therefore, decommissioning of the Proposed Action is not expected to noticeably affect groundwater resources within the vicinity of the Project area. No mitigation is warranted for decommissioning period groundwater use.

Groundwater Quality

Construction, Operation and Maintenance, and Decommissioning

Potential effects of accidental release of pollutants, including geothermal fluid, power plant working fluid, and other water potential quality pollutants on groundwater are addressed previously under the discussion of operation period accidental releases to natural waters. Potential groundwater quality effects of geothermal well drilling, and the withdrawal/injection of geothermal fluid into deep aquifers, are discussed separately in Chapter 4.7**,** Geothermal and Groundwater Resources. No further discussion is warranted.

4.19.4.2 CEQA Significance Determination

Significance conclusions for the impacts identified for each phase of the Project (Construction, Operation and Maintenance, Decommissioning) are presented below based on the CEQA Significance Criteria presented in Section 4.19.3.

a) Violate any water quality standards or waste discharge requirements?

Construction

Potential for construction related reductions in water quality are discussed previously, under Surface Water Quality. As discussed therein, adherence to PDMs, conditions of required permits, and **Mitigation Measures SW-1**, **SW-2**, **and SW-3**, would minimize potential construction period effects on water quality. These measures are also anticipated to prevent or avoid potential violation of applicable water quality standards and discharge requirements. Therefore, with implementation of **Mitigation Measures SW-1**, **SW-2**, **and SW-3**, this impact is considered less than significant.

Operation, and Maintenance

Potential for operation period effects on water quality are discussed previously, under Surface Water Quality. Potential groundwater effects of geothermal well drilling, and the withdrawal/ injection of geothermal fluid into deep aquifers, is discussed separately in Section 4.7, *Geothermal and Groundwater Resources*. As discussed therein, implementation of **Mitigation Measures SW-4, SW-5,** and **SW-6** would ensure that potential operation period impacts are reduced to less than significant levels.

Decommissioning

Potential for decommissioning related effects on water quality are anticipated to be minimal, as discussed previously. No additional mitigation is warranted.

Impact Significance after Mitigation: Less than Significant.

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

Construction, Operation and Maintenance

Construction and operation period groundwater use is addressed previously, under Groundwater Supply and Groundwater Levels. As discussed therein, potential for groundwater depletion is considered minimal, and this impact is considered less than significant.

Decommissioning

Decommissioning could result in additional use of groundwater for dust control. However, the amount of water required for decommissioning is expected to be only a fraction of that required for construction. Therefore, this impact is considered less than significant.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

Construction, Operation and Maintenance, and Decommissioning

Potential for the Proposed Action to alter existing drainage patterns on-site, which could result in increased erosion or sedimentation, is addressed previously under Changes in Drainage Patterns and Stormwater Runoff and Decommissioning. As discussed therein, implementation of mitigation would be required, and adherence to **Mitigation Measure SW-1** would ensure that potential impacts would be less than significant.

Impact Significance after Mitigation: Less than Significant.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Construction, Operation and Maintenance, and Decommissioning

Potential for the Proposed Action to alter existing drainage patterns on-site, which could result in increased or altered surface water runoff, is addressed previously under Changes in Drainage Patterns and Stormwater Runoff and Decommissioning. As discussed therein, implementation of mitigation would be required, and adherence to **Mitigation Measure SW-1** would ensure that potential impacts would be less than significant.

Impact Significance after Mitigation: Less than Significant.

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Construction, Operation and Maintenance, and Decommissioning

Potential for the Proposed Action to result in increased impervious surfaces is addressed previously under Changes in Drainage Patterns and Stormwater Runoff and Decommissioning. As discussed therein, implementation of mitigation would be required, and adherence to **Mitigation Measure SW-1** would ensure that potential impacts would be less than significant.

Impact Significance after Mitigation: Less than Significant.

f) Otherwise substantially degrade water quality?

Construction, Operation and Maintenance, and Decommissioning

Potential degradation of water quality is discussed under CEQA criterion a), above. Additional discussion is not warranted.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

Construction, Operation and Maintenance, and Decommissioning

The Proposed Action would not result in the construction of any structures within a 100-year flood zone. Therefore, no impact would occur.

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Construction, Operation and Maintenance, and Decommissioning

The Proposed Action would not result in the construction of any structures within a 100-year flood zone. Therefore, no impact would occur.

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Construction, Operation and Maintenance, and Decommissioning

The Project area is not protected from flooding by a levee, and would not cause or result in disturbance to any levee or dam. Additionally, the Proposed Action would not result in the construction of housing or other facilities that would support increased population densities, in an area where flooding could occur. Therefore, no impact would occur.

j) Inundation by seiche, tsunami, or mudflow?

Construction, Operation and Maintenance, and Decommissioning

The Proposed Action is not located in proximity to any large lake or other water body that is susceptible to seiche, nor is it located near the ocean where tsunami could occur. Mudflows are anticipated to occur in some areas in the general region around the Project area, in particular within the Tri-Valley Area, which is located approximately 25 miles east of the Project area and in a separate basin. However, mudflows are not expected to occur on-site. Mudflows may be anticipated in areas with loose, highly erosive surface sediment that is or could be denuded of vegetation. Such conditions do not exist on-site. Therefore, potential for mudflows is considered minimal, and this impact is considered less than significant.

4.19.5 Alternative 2: Plant Site Alternative

4.19.5.1 Direct and Indirect Impacts

Potential impacts to all water resources impact topics discussed in this section, for Alternative 2, would be the same as those discussed for the Proposed Action, except that the location of those impacts would be slightly altered according to the Alternative 2 plant site location. Specifically, the proposed plant site would be located approximately 900 feet north of Hot Creek, which is approximately 300 feet closer to a waterway than the plant site in the Proposed Action. Wells 55-32 and 65-32 would be located in the same place as the Proposed Action, but one of the proposed access roads for Well 65-32 would be located approximately 1,000 feet from the Hot Creek tributary (approximately 100 feet closer than the Proposed Action). Other facilities would be located in areas that are internally drained. All mitigation discussed for the Proposed Action would apply to Alternative 2. Please refer to impact discussions for the Proposed Action.

4.19.5.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Impacts would be less than significant with incorporation of mitigation measures.

4.19.6 Alternative 3: Modified Pipeline Alternative

4.19.6.1 Direct and Indirect Impacts

Potential impacts on all water resources discussed in this section, for Alternative 3, would be the same as those discussed for the Proposed Action. Facilities that would be adjacent to Hot Creek and its tributaries would be placed in the same locations as compared to the Proposed Action. Other facilities would be placed in areas that are internally drained. As a result, potential impacts and proposed mitigation associated with installation of those facilities would be similar to the Proposed Action.

4.19.6.2 CEQA Significance Determination

CEQA significance determinations would be the same as described above for the CD-IV Project. Impacts would be less than significant with incorporation of mitigation measures.

4.19.7 Alternative 4: No Action

4.19.7.1 Direct and Indirect Impacts

Under implementation of the No Action Alternative, installation of the proposed power plant, substation, and pipeline facilities would not occur and therefore there would be no impacts on water resources associated with the CD-IV Project.

However, installation of some geothermal exploration wells (11 total) in Basalt Canyon could still occur, in accordance with already approved exploration permits. However, these well installations would be reduced (five fewer wells) in comparison to the Proposed Action. Under the No Action Alternative, a total of 16 wells have been previously approved. Of these 16 wells, five wells have already been completed. The remaining 11 wells that could be installed include 9 slim hole and 2 large diameter geothermal-size exploration (Refer to Chapter 2 for a description of well types) wells. In comparison, the Proposed Action would result in installation of up to 16 new production and injection wells, which are generally the same size as large diameter geothermal exploration wells. Potential impacts associated with implementation of the No Action Alternative would be similar to the Proposed Action for well construction, albeit reduced in intensity. No other impacts would occur.

4.19.7.2 CEQA Significance Determination

Because the No Project Alternative would not include construction and operation of a geothermal power plant and pipelines, the impacts on surface water resources would be less than the CD-IV Project. The exploratory well drilling approved previously would have impacts on water quality related to well drilling and construction similar to the CD-IV Project. Impacts would be reduced to a less-than-significant level with implementation of mitigation measures identified in previous NEPA and CEQA documents.

4.19.8 Cumulative Impacts

4.19.8.1 Geographic Extent/Context

The geographic scope for cumulative impacts from hydrologic resources generally encompasses the Project area, the Town of Mammoth Lakes, and other nearby areas that are located within the same groundwater subbasin and watershed (Hot Creek and its tributaries) as compared to the Proposed Action. Various types of projects could contribute to the cumulative impact of the Proposed Action and alternatives, including existing and proposed geothermal developments, housing development projects, public infrastructure, and recreational trail system projects. These types of past, current and future projects could combine with potential impacts of the Proposed Action or an alternative to affect public health and safety within the geographic extent of this cumulative analysis.

Most of these projects have either undergone independent environmental review pursuant to NEPA and/or CEQA or would do so prior to approval. Even if environmental review has not been completed for the cumulative projects described in Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, their effects were considered in the cumulative impacts analyses in this EIS/EIR.

4.19.8.2 Existing Cumulative Conditions

Existing cumulative conditions with respect to water quality include 303(d) listings along Mammoth Creek for manganese and mercury from natural sources, total dissolved solids from unknown sources, and within Crowley Lake for ammonia and dissolved oxygen. With respect to water supplies and groundwater, available surface water supplies and the underlying groundwater basin are not considered to be overdrafted. The vicinity of the Project area is, outside of Mammoth Creek, sparsely populated and consists largely of open space land within the Inyo National Forest, where development-related impacts on hydrologic resources are generally minimal.

A wide variety of past, present, and reasonably foreseeable future development projects could contribute to cumulative conditions for surface water resources in the cumulative analysis area. Table 4.1-1, presented in Section 4.1.5, *Cumulative Scenario Approach*, lists cumulative projects in the vicinity of the Project site and surrounding area that were used to develop this analysis of cumulative effects for surface water resources.

4.19.8.3 Construction

Proposed Action

Cumulative impacts associated with construction of the Proposed Action would be limited to those projects under construction at the same time and general location as the Proposed Action. Potential construction-related water resources impacts that could contribute to cumulative impacts include accidental releases of pollutants due to construction activities such as grading, trenching, and other construction activities, and also including oils, greases, paints, cement washout, and various other potential pollutants. Acquisition of coverage under the construction stormwater general permit would ensure that no cumulatively considerable impact would occur – other projects disturbing over one acre of land area would also be require to acquire coverage under the permit, and required permitting conditions are sufficient to prevent cumulative degradation of water quality, in order to protect beneficial use.

With respect to releases of water quality pollutants from well drilling and testing, it is assumed for the purposes of this analysis that other potential projects that could involve well drilling and testing would utilize similar methods for containing water quality pollutants. As discussed for direct impacts, this would likely include containment of drilling mud, drill cuttings, and water/geothermal fluid at the drilling site. Accidental release could occur, either on site or from other proposed facilities. Accidental release of geothermal fluid could result in contribution of total dissolved solids (TDS) to the lower portions of Mammoth Creek, where Mammoth Creek is impaired for TDS. Such releases could potentially lead to a cumulatively considerable increase in TDS loading in Mammoth Creek. However, even without mitigation, accidental releases are anticipated to be minimal. With implementation of mitigation designed to contain accidental releases, and assuming that similar mitigation would be applied to other project sites, potential for release of elevated dissolved solids levels would be minimal. Therefore, it is unlikely that the Proposed Action would result in a combined impact that would cause an adverse cumulative effect with respect to water quality.

With respect to impervious surfaces, implementation of the Proposed Action would include disturbance associated with the installation of the proposed power plant, substation, transmission line, well pads, new roads, modification of existing roads, and installation of pipelines. Following completion of construction, new impervious surfaces would remain associated with these structures. However, only a portion of the total area disturbed during construction would remain impervious during operations. Based on USFS requirements, all roadways and other compacted surfaces, even if unpaved, are considered to be impervious. Thus, implementation of the Proposed Action would result in the construction period disturbance of approximately 78.3 acres and in the installation of approximately 17.3 acres of new permanent impervious surfaces, as shown in Table 4.19-1.

**TABLE 4.19-1
TEMPORARY CONSTRUCTION DISTURBANCE AND PERMANENT NEW IMPERVIOUS SURFACES UNDER THE PROPOSED ACTION**

Facility	Temporary Construction Disturbance	Permanent New Impervious Surfaces
Power Plant	6.5	6.5
Substation	0.25	0.25
Transmission Line	0.75	0.0003
Well Pads	40	6.4
New Roads	1.4	1.4
Existing Roads	1.8	1.8
Pipelines	27.6	0.97
Total	**78.3**	**17.3**

SOURCE: ESA 2012 (Appendix F)

During construction, the total impervious surface area associated with the Proposed Action (78.3 acres) would represent about 0.23 percent of the total watershed size (33,914 acres). During operations, total impervious surface area associated with the Proposed Action (17.3 acres) would represent about 0.051 percent of the total watershed size (33,914 acres). Other existing plus cumulative scenario impervious surfaces within the watershed account for 441 acres of impervious surface area. Thus, the total affected surface area within the watershed with implementation of the Proposed Action would increase to 519 acres during construction, or 458 acres during operations, equivalent to approximately 1.51 percent or 1.35 percent, respectively. For this watershed, USFS considers the Threshold of Concern for the cumulative watershed impacts of impervious surfaces to be 10 to 12 percent. Therefore, it is unlikely that the Proposed Action would result in a combined impact that would cause an adverse cumulative effect with respect to impervious surfaces.

With respect to groundwater supply and groundwater levels, the groundwater basin is not currently overdrafted, nor is overdrafting anticipated within the foreseeable future (DWR, 2004). Additionally, based on the cumulative scenario projects considered in this analysis, major new potable groundwater uses are not anticipated. For the purpose of comparison, existing groundwater pumping by the MCWD (the primary groundwater user within the basin) is approximately 1,600 acre-feet per year, whereas the Proposed Action would result in the withdrawal of approximately 64 acre-feet during construction and no groundwater withdrawal during operation. Therefore, it is unlikely that the Proposed Action would result in a combined impact that would cause an adverse cumulative effect with respect to groundwater.

Alternative 2

Implementation of Alternative 2 would result in the installation of similar facilities as compared to the Proposed Action, but with a different location for the plant site. Cumulative scenario projects for Alternative 2 would be the same as those discussed for the Proposed Action. Therefore, similar potential for cumulative impacts would occur for Alternative 2, as compared to the Proposed Action, and it is unlikely that Alternative 2 would result in a combined impact that would cause an adverse cumulative effect on construction period water quality or groundwater.

With respect to impervious surfaces, implementation of Alternative 2 would include disturbance associated with the installation of the same facilities as discussed for the Proposed Action, but some facilities would be sized slightly differently than for the Proposed Action. Table 4.19-2 provides a summary of total construction disturbance and permanent new impervious surfaces that would occur under Alternative 2.

TABLE 4.19-2
TEMPORARY CONSTRUCTION DISTURBANCE AND PERMANENT NEW IMPERVIOUS SURFACES UNDER ALTERNATIVE 2

Facility	Temporary Construction Disturbance	Permanent New Impervious Surfaces
Power Plant	7.3	7.3
Substation	0.25	0.25
Transmission Line	5.6	0.0007
Well Pads	40	6.4
New Roads	1.4	1.4
Existing Roads	1.8	1.8
Pipelines	26.8	0.94
Total	**83.2**	**18.1**

SOURCE: ESA 2012

During construction, the total impervious surface area associated with the Alternative 2 (83.2 acres) would represent about 0.25 percent of the total watershed size (33,914 acres). During operations, total impervious surface area associated with the Alternative 2 (18.1 acres) would represent about 0.053 percent of the total watershed size (33,914 acres). Other existing plus cumulative scenario impervious surfaces within the watershed account for 441 acres of impervious surface area. Thus, the total affected surface area within the watershed with implementation of Alternative 2 would increase to 524 acres during construction, or 459 acres during operations, equivalent to approximately 1.55 percent or 1.35 percent, respectively. For this watershed, USFS considers the Threshold of Concern for the cumulative watershed impacts of impervious surfaces to be 10 to 12 percent. Therefore, it is unlikely that Alternative 2 would result in a combined impact that would cause an adverse cumulative effect with respect to impervious surfaces.

Alternative 3

Implementation of Alternative 3 would result in the installation of similar facilities as compared to the Proposed Action. Cumulative scenario projects for Alternative 3 would be the same as those discussed for the Proposed Action. Therefore, it is unlikely that Alternative 3 would result in a combined impact that would cause an adverse cumulative effect.

With respect to impervious surfaces, implementation of Alternative 3 would include disturbance associated with the installation of the same facilities as discussed for the Proposed Action, but some facilities would be sized slightly differently than for the Proposed Action. Table 4.19-3 provides a summary of total construction disturbance and permanent new impervious surfaces that would occur under Alternative 3.

TABLE 4.19-3
TEMPORARY CONSTRUCTION DISTURBANCE AND PERMANENT NEW IMPERVIOUS SURFACES UNDER ALTERNATIVE 3

Facility	Temporary Construction Disturbance	Permanent New Impervious Surfaces
Power Plant	7.3	7.3
Substation	0.25	0.25
Transmission Line	5.6	0.0007
Well Pads	40	6.4
New Roads	1.4	1.4
Existing Roads	1.8	1.8
Pipelines	26.8	0.94
Total	**83.2**	**18.1**

SOURCE: ESA 2012

During construction, the total impervious surface area associated with the Alternative 3 (83.2 acres) would represent about 0.25 percent of the total watershed size (33,914 acres). During operations, total impervious surface area associated with Alternative 3 (18.1 acres) would represent about 0.053 percent of the total watershed size (33,914 acres). Other existing plus cumulative scenario impervious surfaces within the watershed account for 441 acres of impervious surface area. Thus, the total affected surface area within the watershed with implementation of Alternative 3 would increase to 524 acres during construction, or 459 acres during operations, equivalent to approximately 1.55 percent or 1.35 percent, respectively. For this watershed, USFS considers the Threshold of Concern for the cumulative watershed impacts of impervious surfaces to be 10 to 12 percent. Therefore, it is unlikely that Alternative 3 would result in a combined impact that would cause an adverse cumulative effect with respect to impervious surfaces.

No Action

Under the No Action Alternative, the power plant, substation, and other facilities associated with the CD-IV Project would not be installed, except for some exploratory geothermal wells (11 total), which could still be installed. As a result, potential for the No Action Alternative to result in a cumulatively considerable impact on water quality or groundwater would be less than that indicated for the Proposed Action. Therefore, it is unlikely that the No Action Alternative would result in a combined impact that would cause an adverse cumulative effect on construction period water quality or groundwater.

4.19.8.4 Operation and Maintenance

Proposed Action

Operation and maintenance of the Proposed Action would occur over approximately the next 30 years. During that time, as discussed for direct impacts, accidental releases of potential water quality pollutants to natural waters could occur. Potential sources of water quality pollutants that could be released include geothermal fluid that would be circulated through proposed facilities, as well as accidental releases from routine storage and use of various water polluting chemicals, including fuels, oils, and other chemicals that would be used during maintenance and operations. However, as discussed for direct impacts, potential for release of these constituents would be minimized via adherence to materials handling requirements and proposed mitigation.

In consideration of other potential cumulative projects that are relevant to this analysis, there exists a potential for accidental release of similar water quality pollutants from select projects. However, similar to the Proposed Action, release of potential water quality pollutants from other projects would be expected to occur only on an intermittent basis, and in the event of an accidental spill. Cumulative projects would be required to adhere to similar legal requirements for the handling of potentially hazardous water quality pollutants. Additionally, because other cumulative projects would be required to comply with CEQA and potentially NEPA, it is reasonable to assume that similar mitigation measures as those applied here would be implemented for cumulative projects, in order to ensure that water quality releases would be minimized.

As discussed for direct impacts, the Proposed Action would result in the installation of new impervious surfaces. Other cumulative projects would also be expected to result in the installation of new impervious surfaces. During operation of the Proposed Action and cumulative projects, increased impervious surface coverage could result in increased runoff on site, which could contribute to hydrologic changes downstream. Potential increases in stormwater generated by impervious surfaces for the Proposed Action would be minimized via adherence to applicable mitigation, which would require no net increase in stormwater discharge from the Project area. Additionally, it is anticipated that other cumulative scenario projects would be required to implement similar mitigation measures in order to comply with CEQA and/or NEPA. Therefore, cumulative scenario impacts are anticipated to be minimal.

With respect to groundwater supplies, as discussed for direct impacts, the Proposed Action would result only in minimal water use during operation and maintenance. Other cumulative scenario projects could result in a net increase in water use within the groundwater basin. However, as discussed for cumulative construction impacts, the groundwater basin is not in a state of overdraft. Therefore, operation and maintenance of the Proposed Action would not contribute to a cumulative scenario impact with respect to groundwater supplies. In consideration of the potential combined impacts associated with concurrent implementation of all cumulative scenario projects plus the Proposed Action, it is therefore unlikely that the Proposed Action would result in a combined impact that would cause an adverse cumulative effect on operation and maintenance period water quality, surface hydrology, or groundwater.

Alternative 2

Implementation of Alternative 2 would result in operation and maintenance for similar facilities as compared to the Proposed Action, but in slightly difference locations. Cumulative scenario projects for Alternative 2 would be the same as those discussed for the Proposed Action. As a result, similar potential for cumulative impacts would occur for Alternative 2, as compared to the Proposed Action. Therefore, it is unlikely that Alternative 2 would result in a combined impact that would cause an adverse cumulative effect on operation and maintenance period water quality, surface hydrology, or groundwater.

Alternative 3

Implementation of Alternative 3 would result in operation and maintenance for similar facilities as compared to the Proposed Action. Cumulative scenario projects for Alternative 3 would be the same as those discussed for the Proposed Action. As a result, similar potential for cumulative impacts would occur for Alternative 3, as compared to the Proposed Action. Therefore, it is unlikely that Alternative 3 would result in a combined impact that would cause an adverse cumulative effect on operation and maintenance period water quality, surface hydrology, or groundwater.

No Action Alternative

Under the No Action Alternative, the power plant, substation, and other facilities associated with the Proposed Action would not be installed, except for 11 new geothermal exploration wells, which could still be installed. Operation and maintenance of these wells would differ because road hardening and year-round access would not be required. Operation and maintenance of these wells would not meaningfully contribute to new impervious surfaces, as relevant to cumulative scenario projects. Therefore, it is unlikely that the No Action Alternative would result in a combined impact that would cause an adverse cumulative effect on operation and maintenance period water quality or groundwater.

4.19.8.5 Decommissioning

Proposed Action

Impacts of Project decommissioning would be similar to construction impacts, albeit with a reduced intensity. Decommissioning impacts would be primarily related to an inadvertent release of potential water quality pollutants from the facilities being decommissioned and construction equipment during the decommissioning process. Decommissioning would be expected to comply with relevant stormwater permitting requirements which, similar to Project construction, would require adherence to conditions designed to minimize water quality pollution. Well decommissioning would not involve testing. Finally, water use during decommissioning would be minimal. Therefore, it is unlikely that the Proposed Action would result in a combined impact that would cause an adverse cumulative effect on hydrologic resources during decommissioning.

Alternative 2

Decommissioning of Alternative 2 would result in similar activities as compared to the Proposed Action, except that proposed facilities would be installed in a slightly different location under Alternative 2. Therefore, it is unlikely that Alternative 2 would result in a combined impact that would cause an adverse cumulative effect on hydrologic resources during decommissioning.

Alternative 3

Decommissioning of Alternative 3 would result in similar activities as compared to the Proposed Action. Therefore, it is unlikely that Alternative 3 would result in a combined impact that would cause an adverse cumulative effect on hydrologic resources during decommissioning.

No Action

The No Action Alternative would involve the installation of some of the proposed geothermal exploration wells (11 total) identified for the Proposed Action. Decommissioning of these wells would be required at the end of their usable lifetime. However, no other facilities would be installed that would require decommissioning. Therefore, potential for cumulatively considerable effects on water resources would be reduced in extent as compared to the Proposed Action. Therefore, it is unlikely that the No Action Alternative would result in a combined impact that would cause an adverse cumulative effect on hydrologic resources during decommissioning.

4.19.8.6 CEQA Significance Determinations

For construction related water quality emissions, as discussed for the cumulative discussion provided above, potential releases of construction period water quality pollutants during construction, including release of pollutants during well construction and testing, would be limited by adherence to permitting requirements and mitigation as warranted, for the Proposed Action and for cumulative scenario projects. During operations, accidental releases of potential water quality pollutants would be minimized via adherence to hazardous materials storage and handling regulations that would be applicable to the Proposed Action and to all cumulative scenario projects. Similarly, potential operation period releases of geothermal fluid would be minimized by adherence to applicable mitigation for the Proposed Action, while similar mitigation measures would presumably be employed for relevant cumulative scenario projects, in accordance with CEQA and NEPA requirements for minimization of potential impacts. Potential changes to stormwater hydrology as a result of the installation of new impervious surfaces would similarly be minimized for the Proposed Action and cumulative scenario projects, as discussed previously, and a cumulatively considerable scenario would be avoided. Finally, as discussed previously, neither the Proposed Action nor potential cumulative scenario projects would draw groundwater from an overdrafted aquifer. Consequently, the Proposed Action’s incremental contribution with respect to hydrologic resources would not be cumulatively considerable and the cumulative impact would be less than significant.

4.19.9 Mitigation Measures

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 Drainage Plan adheres to the following:

The Applicant shall prepare and submit to the LRWQCB, BLM and USFS for review the Drainage Plan that shall encompass 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 at least one foot of 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. 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.

Mitigation Measure SW-7: This mitigation measure shall modify PDM HYD-2 – To the extent feasible, the pipeline route and any access roads shall avoid RCAs. Any additional action, requirements, and/or designations with respect to RCAs shall be based upon guidance from USFS staff and consistent with the relevant USFS policy.

4.19.10 Residual Impacts after Mitigation Incorporated

Residual impacts after the incorporation of mitigation include the following: (1) Potential residual degradation of water quality associated with construction activities. Although potential construction-related water quality degradation would be minimized, some minor degree of water quality loss could still occur; however, it would not be sufficient to affect beneficial uses.
(2) Potential residual degradation of water quality associated with operations could occur. In the event of an accidental spill of geothermal fluid or other pollutants, even with implementation of proposed containment and cleanup procedures, some degree of residual contamination of surface water or groundwater quality could occur. (3) Potential residual minor changes in drainage and runoff could occur. Even with the implementation of the proposed grading and drainage plan, the Proposed Action would still result in changes to on-site hydrology. These changes would primarily be contained to the site and its immediate surroundings, and are not anticipated to result in noticeable change downstream.

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CHAPTER 5
Other Required CEQA/NEPA Considerations

5.1 Unavoidable Adverse Effects

Section 15126.2(b) of the CEQA Guidelines requires that an EIR identify the significant environmental effects which cannot be avoided if the CD-IV Project is implemented. The analysis contained in Sections 4.2 through 4.19 indicates that the potential environmental effects from implementation of the CD-IV Project would cause significant impacts, although most of those can be reduced to a level that is below significant with mitigation measures. Significant unavoidable impacts on air quality were identified resulting from construction equipment emissions and power plant operation. Also, given the high visibility and visual sensitivity of the Project area, collectively, operation of the new pipelines and well facilities would result in a significant and unavoidable impact. Under Alternative 2, Alternative Plant Site, the long-term operation and maintenance of the power plant would exceed the Mono County nighttime exterior noise standard at the nearby Chance Ranch residence[1]. Because mitigation to reduce power plant operation noise would not be practicable or feasible, Alternative 2 would result in a significant unavoidable impact with respect to the generation of noise levels in excess of local standards. Under Alternative 2, the power plant would be at a similar elevation as the existing power plant facilities (MP-II and PLES I) and could be partially visible from local highways and roads. Furthermore, the new pipelines (spanning approximately 12 feet wide) and well facilities would be highly visible from scenic roads and resources. Even with implementation of PDMs and the landscaping mitigation measure, impacts on the visual character of the Project area would be significant and unavoidable.

Under Alternative 3, Modified Pipeline Alternative, less geothermal piping would be constructed parallel to Sawmill Cutoff Road (NFSR 03S08) and at locations where a new pipeline must cross another pipeline (either existing or new), the pipeline crossings would be underground. Although these pipeline modifications would reduce adverse visual effects, the new pipelines (spanning approximately 12 feet wide) and the new well facilities would still be highly visible in some visually sensitive areas. Therefore, even with implementation of PDMs and the landscaping mitigation measures, Alternative 3 would result in a substantial adverse effect on the visual character and quality of the site, resulting in a significant and unavoidable impact.

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1 LADWP has purchased Chance Ranch and it is speculated that no one currently lives there. However, for the purposes of this analysis, it is considered a sensitive receptor as individuals are not precluded from staying at the residence for extended periods of time.

5.2 Significant Irreversible Environmental Changes

Section 15126.2(c) of the CEQA Guidelines requires that an EIR identify significant irreversible environmental changes that would be caused by a proposed project. These changes may include, for example, uses of nonrenewable resources, or provision of access to previously inaccessible areas, as well as project accidents that could change the environment in the long term. Development of the CD-IV Project would require a permanent commitment of natural resources resulting from the direct consumption of fossil fuels, construction materials, the manufacture of new equipment, some of which would not be recyclable at the end of the CD-IV Project's useful lifetime, and energy required for the production of materials. A number of new access routes to various well pads from existing roads would be constructed for the CD-IV Project. These access routes would be short, and would only provide access to proposed well sites; proposed access routes would not provide public access to previously undeveloped forest areas. Access routes would be reclaimed during Project decommissioning.

Accidents, such as the release of hazardous materials or fires, could trigger irreversible environmental damage depending upon the severity of the incident. As discussed in Section 4.13, *Public Health and Safety, Hazardous Materials and Fire*, Project construction, operation and decommissioning would involve the use of hazardous materials, such as n-pentane, diesel fuel, lubricants, drilling muds and additives, and paints. An accidental spill of any of these substances could affect soils, water and/or groundwater quality. However, implementation of emergency contingency plan measures would minimize the extent of releases and cleanup actions would be required by the regulatory agencies, therefore, it is unlikely that such a release would cause irreversible environmental damage. Similarly, the potential exists for fires resulting from construction and maintenance activities in the wellfield or from the use of flammable materials at the power plant. PDMs, fire safety regulations and implementation of fire prevention plans would ensure that safety risks are reduced to the extent practicable. Therefore, significant irreversible changes from accidents are not anticipated.

5.3 Growth-Inducing Impacts

The Bureau of Land Management (BLM National Environmental Policy Act (NEPA Handbook (H-1790-1 Sec. 9.2.9), the NEPA Guidelines (40 CFR 1502.16), and CEQA Guidelines Section 15126.2 require a discussion of any growth-inducing impacts caused by implementation of the proposed CD-IV Project or one of the action alternatives.

Section 15126.2 (d) of the CEQA Guidelines requires the evaluation of economic, population, or housing growth in the surrounding environment with implementation of the proposed project. Induced growth is growth that exceeds planned growth in the surrounding area and that results from new development that would not have taken place if the project had not been implemented. CEQA requires a discussion of the ways in which a proposed project may foster economic or population growth, or the construction of additional housing (directly or indirectly) in the surrounding environment. The discussion must also address how a proposed project may remove obstacles to growth, or encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. Typically, the growth-inducing potential of a project would be considered significant if it fosters population growth above what is assumed in local and regional land use plans, or in projections made by regional planning authorities. Significant growth impacts could also occur if a project provides infrastructure or service capacity to accommodate growth levels beyond those permitted by local or regional plans and policies.

As discussed in Section 4.15, the CD-IV Project construction workforce could peak at a maximum of 120 workers during each phase of construction. While some of these workers would be recruited locally, most would be specialized craft workers from outside the Mono County area. Typically, non-local skilled craft workers do not bring families with them for short-term construction assignments, but rather rent temporary space in the local rental housing market, stay in local hotels, or bring RV and trailer home units to local RV parks and campgrounds. Because Mono County has a relatively high vacancy rate in its rental housing market, available rental housing could readily absorb the entire 120 peak workers envisioned without requiring construction of any new housing. Due to the short-term nature of construction activities, it is not anticipated that workers would permanently relocate locally for temporary construction employment. Therefore, notable impacts would not occur to existing population levels or employment distribution within the study area from the Project. Employment of construction personnel would be beneficial to local businesses and the regional economy through increased expenditure of wages for goods and services. Construction personnel would purchase food, beverages, and other commodities, which would provide economic benefit to the local economy.

Operation and maintenance of the CD-IV Project would employ approximately 6 full-time employees. Assuming a worst-case scenario of all 6 full-time workers relocating locally (including an average family size of three persons per household), these relocations would a negligible effect on population growth in Mono County and are anticipated to be within forecasted growth projections of the area. Potential employment relocations would not be beyond the capacity of available housing or public services and facilities. Therefore, employment associated with the CD-IV Project is not considered to generate an adverse direct growth-inducing impact.

With respect to inducing growth through providing access to previously undeveloped areas, the proposed CD-IV Project would involve construction of temporary and permanent roads. However, as discussed in Section 4.16, *Transportation*, these roads would provide limited access to the proposed well pads and power plant. Project roadways would not provide access into other adjacent areas whereupon new access may create the generation of residential or commercial development. Therefore, roadway facilities associated with the proposed CD-IV Project would not induce growth.

As described in Chapter 1, the fundamental objective of the CD-IV Project is to construct, operate, maintain, and eventually decommission a 33 MW geothermal electricity generating facility and associated interconnection transmission infrastructure to provide renewable electric power to California’s existing transmission grid to help meet federal and state renewable energy supply and GHG emissions reduction requirements. The CD-IV Project is not intended to supply power-related to growth for any particular development and would not result in direct growth-inducing impacts. However, it could facilitate growth indirectly through the additional generation of electric power in the eastern California region. By increasing power generation in eastern California, the CD-IV Project could be considered growth-inducing. Power generated by the CD-IV Project would be transmitted to the SCE electricity distribution system. SCE provides power to 180 cities in 50,000 square miles of service area encompassing 11 counties in central, coastal and southern California (SCE, 2012). These areas have experienced rapid population growth over the last 20 years. Growth is expected to continue with or without implementation of the CD-IV Project. Therefore, implementation of the CD-IV Project would be in response to anticipated future load growth and would be consistent with current regional planning projections.

5.4 Irreversible and Irretrievable Commitments of Resources

The BLM NEPA Handbook (H-1790-1 Sec. 9.2.9), the NEPA Guidelines (40 CFR 1502.16) require an analysis of the significant irreversible effects of a proposed action. Resources irreversibly or irretrievably committed to a proposed action are those used on a long-term or permanent basis. This includes the use of nonrenewable resources such as metal, wood, fuel, paper, and other natural or cultural resources. These resources are considered non-retrievable in that they would be used for a proposed action when they could have been conserved or used for other purposes. Another impact that falls under the category of irreversible and irretrievable commitment of resources is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

The Proposed Action and Alternatives 2 and 3 would irretrievably commit resources over the 30-year life of the geothermal plant. Construction of the proposed CD-IV Project would commit nonrenewable resources. During operation, n-pentane, fuels and lubricants, and other nonrenewable resources also would be consumed, although on a limited basis. After approximately 30 years, the CD-IV Project would be decommissioned and the land returned to its pre-Project state. It is anticipated that, with revegetation, full recovery of surface resources on the Project site would be achieved, although the possibility exists that currently unknown factors could affect site conditions during that time. Currently, the CD-IV Project site is not entirely undisturbed due to existing roads and OHV-related recreational use.

The analysis of whether the CD-IV Project would irretrievably consume geothermal resources over its 30-year life is more difficult to predict, as numerous variables affect geothermal reservoir conditions, such as climatic conditions and rainfall. To date, geothermal power production has occurred for more than 25 years in the Casa Diablo area. The CD-IV Project would return 100 percent[2] of the extracted geothermal fluid to the reservoir and would be managed to maintain reservoir production. Current forecasts indicate that, over the 30-year life of the CD-IV Project

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[2] A negligible amount of geothermal fluid may be used during construction or for fire protection purposes.

with continued production from the existing Casa Diablo facilities, declines in reservoir pressure would range from 1.45 to 10.2 psi (0.1 to 0.7 bar) and the produced temperature of geothermal wells would decline about 18^{o} F (10^{o}C). This forecast pressure and temperature would be similar to that observed in the geothermal reservoir around 2005, before some production shifted to Basalt Canyon. Decommissioning of the CD-IV Project and the other existing Casa Diablo geothermal developments could result in a recovery of some of the pressure and temperature declines over time.

The CD-IV Project is a renewable energy project intended to generate geothermal energy to reduce reliance on fossil fuels. Over its projected 30-year life, it would contribute incrementally to the reduction in demand for fossil fuel use for electricity-generating purposes. Therefore, this incremental reduction in expending fossil fuels would be a positive effect of the CD-IV Project's commitment of nonrenewable resources.

5.5 Short-Term Uses and Long-Term Productivity

The BLM NEPA Handbook (H-1790-1 Sec. 9.2.9) and the NEPA Guidelines (40 CFR 1502.16) require a discussion of the relationship between short-term uses and long-term productivity of the environment from implementation of the proposed action or one of the action alternatives. In this context, "short term" refers to the duration of project construction and "long term" refers to an indefinite period beyond construction during which project impacts may still affect the environment. The specific impacts of a project vary in kind, intensity, and duration according to the activities occurring at any given time. The CD-IV Project involves tradeoffs between long-term productivity and short-term uses of the environment.

Short-term uses of the environment as a result of the CD-IV Project and its build alternatives include those typically associated with geothermal energy development. Short-term impacts described in Chapter 4, *Environmental Consequences*, include effects on the natural environment, cultural resources, and recreation resources. These can be compared to the long-term benefits of the Proposed Action and its build alternatives, all of which would provide for the production of clean, renewable energy consistent with Federal and State goals to increase production of renewable energy to help reduce dependence on fossil fuels.

As discussed above in Section 5.4, *Irreversible and Irretrievable Commitment of Resources*, the Proposed Action and build alternatives are not anticipated to permanently damage forest habitats and hydrologic features and, therefore, would not adversely affect the long-term productivity of surface resources. The CD-IV Project, in combination with the existing Casa Diablo geothermal facilities, is forecast to somewhat reduce the pressure and temperatures in the geothermal reservoir, although some recovery may occur after decommissioning of the projects. However, these build alternatives also would provide a long-term benefit by generating electric power with minimal increase in the use of non-renewable resources such as fossil fuels, which would result in a benefit to air quality and a reduction in carbon-based emissions.

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CHAPTER 6
Consultation, Coordination, and Public Participation

6.1 Scoping

The BLM, USFS and the GBUAPCD 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 BLM, USFS, GBUAPCD, 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 began 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 Notice of Preparation (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 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. Two scoping meetings were conducted on April 18-19, 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 of the Final EIS/EIR.

The BLM also established a website that describes the CD-IV Project, the environmental review process, and various methods for providing public input, including the phone number where the BLM's Project Manager for the Project (Collin Reinhardt) may be reached, physical addresses where Project documents may be reviewed, and an e-mail address where comments may be sent electronically: http://www.blm.gov/ca/st/en/fo/bishop.html

6.2 Organizations and Persons Consulted

6.2.1 Native American Government to Government Consultation

The BLM and USFS consulted with Indian tribes in the vicinity of the CD-IV project area on a government-to-government basis in accordance with several authorities including NEPA, the NHPA, the American Indian Religious Freedom Act, and Executive Order 13007.The USFS and BLM invited Indian tribes to consult on a government-to-government basis at the earliest stages of Project planning, and the Agencies and the Applicant have followed up with additional correspondence, communication, and other information since then. USFS contacted the California Native American Heritage Commission (NAHC) for a list of local Native Americans who might have concerns about the Project area and requested a search of the Sacred Lands File to determine whether there were any known places of traditional importance in the vicinity of the Project. The NAHC responded with the list of individuals and organizations potentially interested in the Project. The list was generated from NAHC lists for Mono and Inyo Counties, earlier consultations regarding the project area, and from phone calls by Crystal West, USFS Zone Archaeologist (Personal Communication Sarah Johnston, USFS August 22, 2012).

The USFS sent tribal scoping letters in April 2010 to individuals identified to provide information about the Project, solicit guidance about the scope and content of the EIS/EIR, and invite Indian tribes' participation in the environmental review process. Tribes also were invited to consult with the USFS at a meeting held on May 27, 2010 at the USFS/BLM office. Tribes and interested groups present at the meeting included the Benton, Mono Lake Kutzadika´a, Basketmakers, Big Pine and Lone Pine tribes. Table 6-1 presents a summary of USFS tribal consultation efforts.

TABLE 6-1
SUMMARY OF USFS TRIBAL CONSULTATION EFFORTS

Bishop	William Vega, Chair	4/22/2010	Certified Letter	Casa Diablo IV Geothermal expansion
Benton	Mike Keeler, Chair	4/22/2010	Certified Letter	Casa Diablo IV Geothermal expansion
Big Pine	David Moose, Chair	4/22/2010	Certified Letter	Casa Diablo IV Geothermal expansion
Mono Lake	C. Lange, Chair	4/22/2010	Certified Letter	Casa Diablo IV Geothermal expansion
Bridgeport	Joseph Sam, Chair	4/22/2010	Certified Letter	Casa Diablo IV Geothermal expansion
Mono Lake	Raymond Andrews, Vice Chair	5/27/2010	Meeting	Casa Diablo IV Geothermal expansion
Benton	Anita Dragon, Member	5/27/2010	Meeting	Casa Diablo IV Geothermal expansion
Big Pine	Alan Bacock, Env. Office	5/27/2010	Meeting	Casa Diablo IV Geothermal expansion
Lone Pine	Loretta Howard, member	5/27/2010	Meeting	Casa Diablo IV Geothermal expansion

Additionally, the BLM sent tribal scoping letters in June 2012 that invited Indian tribes to join consultation on the Project and asked if areas of cultural or religious significance exist in the Project area. The BLM conducted a field trip to the Project area and held meetings with the various tribes to describe the CD-IV Project and solicit input on the environmental review process. Table 6-2 summarizes the BLM tribal consultation efforts.

TABLE 6-2
SUMMARY OF BLM TRIBAL CONSULTATION EFFORTS

Bishop	Chad Delgado, Chair	6/29/2012	Certified Letter	Casa Diablo IV Geothermal Expansion project. Invitation to join consultation. Asked if areas of cultural or religious significance to the tribes exist in the project area.
Benton	Jake Saulque, Chair	6/29/2012	Certified Letter	Casa Diablo IV Geothermal Expansion project. Invitation to join consultation. Asked if areas of cultural or religious significance to the tribes exist in the project area.
Big Pine	David Moose, Chair	6/29/2012	Certified Letter	Casa Diablo IV Geothermal Expansion project. Invitation to join consultation. Asked if areas of cultural or religious significance to the tribes exist in the project area.
Mono Lake	C. Lange, Chair	6/29/2012	Certified Letter	Casa Diablo IV Geothermal Expansion project. Invitation to join consultation. Asked if areas of cultural or religious significance to the tribes exist in the project area.
Bishop	Council, THPO[1]	8/7/2012	Council Meeting	Casa Diablo IV Geothermal expansion. Updated on survey results, asked for input of Sacred Sites, Traditional Cultural Properties (TCPs)s, culturally significant sites.
Big Pine, Bishop, Mono, Benton	THPOs	8/6/2012	Phone Call	Invite to CDIV Field Trip, scheduled for 8/21/2012
Bishop	Monty Bengochia, Council member; Raymond Andrews, THPO	8/21/2012	Meeting	Field Trip To CDIV Project Area
Big Pine	Council, THPO	8/21/2012	Meeting	Casa Diablo IV Geothermal expansion. Updated on survey results, asked for input of Sacred Sites, TCPs, culturally significant sites.
Bishop	Council	9/5/2012	Meeting	Presentation on geothermal development, focus on geology, plant specifics, differences from Coso.
Big Pine	Council	12/19/2012	Meeting	Casa Diablo IV update, survey findings, process
Bishop	Council	2/12/2013	Meeting	Casa Diablo IV update, survey findings, process
Bishop	Council/THPO	5/14/2013	Meeting	Casa Diablo IV MOA, update. No tribal concerns

NOTE:
[1] Tribal Historic Preservation Officer

6.2.2 NHPA Section106 Consultation

Federal agencies must demonstrate compliance with the NHPA (16 U.S.C. 470, et seq.). NHPA Section 106 requires a federal agency with jurisdiction over a project to evaluate the effect of the proposed project on properties included on, or eligible for, the NRHP. Federal agencies also must provide the ACHP an opportunity to comment on the effects of the proposed project to those properties. Under NHPA Section 106, the BLM and USFS consult with Indian tribes as part of its responsibilities to identify, evaluate, and resolve adverse effects on cultural resources affected by its undertakings.

Section 4.6, *Cultural Resources*, describes the potential effects of the Proposed Action and alternatives on cultural resources. Alternative 3 was designed to avoid impacts to known cultural resources. Inadvertent effects on cultural resources would be resolved through compliance with the terms of a Memorandum of Agreement (MOA) developed and agreed to in accordance with NHPA Section 106 and its implementing regulations (36 CFR §800.6(c)). Implementation of the Proposed Action also requires local and state agencies to demonstrate compliance with CEQA. Local agencies may use the NHPA process to demonstrate compliance with those CEQA requirements. Analysis of impacts in this document and execution of the MOA would provide evidence of BLM and USFS satisfaction of their obligation under NHPA Section106 and NEPA, as well as the GBUAPCD's compliance with CEQA with respect to cultural resources. The basic steps in the Section106 process are described in Section 3.6, *Cultural Resources*.

6.2.3 Endangered Species Act

The federal Endangered Species Act (FESA) (16 USC §1531 et seq.) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The USFWS is the lead federal agency responsible for implementing FESA protection for inland fisheries, and terrestrial plants and wildlife. The law requires that federal agencies, in consultation with the USFWS, ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife, without receiving a take authorization (described below), including activities that may harm or injure fish or wildlife, or cause significant habitat modification or degradation that significantly impairs essential behavioral patterns of fish or wildlife.

The BLM, Bishop Field Office, is the lead federal agency for Section 7 consultation with the USFWS. The USFS, Inyo National Forest is a cooperating federal agency. If the BLM, in cooperation with the USFS, determines that the Proposed Action may affect Owens tui chub or designated critical habitat, the Bishop Field Office will initiate the appropriate level of consultation with the USFWS, in accordance with legal and policy requirements. No consultation is required if the lead federal agency determines that there is no effect on a listed species or critical habitat. If the lead agency determines that the Proposed Action may affect a federally-listed species or designated critical habitat, it must determine whether the action is likely, or not likely, to adversely affect the species or habitat.

For the CD-IV Project, the BLM and USFS are preparing a biological assessment based on the analysis from the Final EIS/EIR to determine whether or not the CD-IV Project may affect federally-listed species or designated critical habitat. Preliminary analysis has determined the need to initiate consultation with the USFWS, because the project may affect but is not likely to adversely affect Owens tui chub.

6.2.4 Bald and Golden Eagle Protection Act

Bald and golden eagles are protected by three federal laws: the Bald and Golden Eagle Protection Act (BGEPA), the Migratory Bird Treaty Act (MBTA) and the Lacey Act. These laws prohibit the possession, use and sale of eagle feathers and parts as well as a number of other activities, including the transportation of eagles and feathers and parts that have been illegally obtained. The BGEPA, prohibits the “take” of golden eagles during otherwise lawful activities that could otherwise kill, disturb, agitate, or harm eagles, their nests or their eggs to a degree that the action causes, or is likely to cause, based on best available scientific information available: (1) injury to an eagle; (2) decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

On September 11, 2009, the USFWS set in place rules (50 CFR § 22.26) establishing two new permit types to allow the take of bald eagles and golden eagles where the taking is associated with but not the purpose of the activity and cannot practicably be avoided. The regulation at 50 CFR § 22.27 establishes permits for removing eagle nests where: (1) necessary to alleviate a safety emergency to people or eagles; (2) necessary to ensure public health and safety; (3) the nest prevents the use of a human-engineered structure; or (4) the activity or mitigation for the activity will provide a net benefit to eagles. Only inactive nests may be taken, except in the case of safety emergencies.

BLM guidance for complying with the BGEPA (Instructional Memorandum (IM) 2010-156) requires that the consideration of golden eagles and their habitat be incorporated into the NEPA analysis for all renewable energy projects. In considering if a proposed action has the potential to impact golden eagles or their habitat, BLM must consider as part of the affected environment whether breeding territories/nests, feeding areas, roosts, or other important golden eagle use areas are located within the analysis area. The analysis area is determined on an individual project-specific basis.

If the BLM determines that the proposed project is not anticipated to have a potential to impact golden eagles or their habitat, then the finding is documented as part of the affected environment and no further action is required. Alternately, if the action has the potential to impact golden eagles or their habitat, a detailed analysis is performed in coordination with the USFWS that includes an assessment of direct, indirect, and cumulative effects, best management practices and an avian protection plan to minimize the possibility of the unintentional take, and coordination with the USFWS. The BLM will not issue a notice to proceed for any project that is likely to result in take of bald eagles and/or golden eagles until the applicant completes its obligation under applicable requirements of the BGPA, including completion of any required procedure for coordination with the USFWS or any required permit. Based on a thorough review of the affected environment, it appears that the CD-IV Project will not affect golden eagles or their habitat, and no further action will be required by BLM to satisfy the BGEPA, MBTA, or Lacey Act with regard to this species.

6.2.5 California Endangered Species Act

The CDFW has jurisdiction over state-listed threatened and endangered species listed under CESA (Fish and Game Code Section 2050 et seq). If effects to state-listed species are anticipated, consultation with the CDFW is required to ensure that any proposed project is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat. Because the CD-IV Project may alter habitat for species that are both federally and state–listed, but would not have any adverse impacts to listed species, informal consultation with CDFW is anticipated to satisfy CESA requirements. The BLM will use the analysis within the Final EIS/EIR to determine whether or not the project may affect state-listed species and consult with the CDFW on an informal basis to satisfy CESA and determine the potential need for further permitting under Fish and Game Code Section 2080.1 (Consistency Determination) or Section 2080.1 (Incidental Take Permit) authorization.

6.3 Summary of Scoping Comments

NEPA and CEQA project scoping for the CD-IV Project identified several issues to be considered during analysis. These include:

1. Air quality, odor, greenhouse gas emissions;
2. Archaeological and cultural resources, including the potential for interference with current culturally important uses;
3. Biological resources, including the potential for loss of habitat and wildlife movement corridors, and impacts to special-status species;
4. Hydrology and water resources, including surface and groundwater supply, flows, temperatures, and quality;
5. Public safety and health, related to well blowouts, pressurized pipeline releases and fires;
6. Recreational resources, such as effects on Nordic trail use, conflicts with pipelines and recreational opportunities in the Shady Rest area, and aesthetic, noise, and other potential safety impacts in and near recreation areas; and
7. Noise effects on local fauna and recreational users
8. Cumulative effects of project with the existing geothermal facilities at Casa Diablo.

6.4 Draft EIS/EIR Public Comment Process

The Draft EIS/EIR was distributed for public and agency review and comment on November 16, 2012; the Notice of Availability was published in Federal Register (77 FR 68813). The comment period ended January 15, 2013. In response to requests the comment period was extended to January 30, 2013. The MCWD submitted an additional request for an extension of time to submit comments on the Draft EIS/EIR. This request was granted by the GBUAPCD for the CEQA process, however, the BLM agreed to accept late comments to the extent practicable. The supplemental comment letter from MCWD was received on February 20, 2013.

Twenty-eight comment letters were received during the comment period; one letter was received after the close of the comment period. Responses to all 28 letters are provided in this Final EIS/EIR in addition to oral comments received.

Section 6.4.1 describes the format and organization of the comments received on the Draft EIS/EIR and the responses to those comments. Section 6.4.2 provides a list of the comment letters received on the Draft EIS/EIR from agencies, members of the public, and organizations. Section 6.4.3 provides consolidated responses (called "Common Responses") for topics on which a number of similar and related comments were received. Individual responses to each individual comment are provided in Appendix H.

6.4.1 Format of the Responses to Comments

Each comment letter has been assigned an alphabet letter and a number designating order of receipt within each of the categories identified above. Agency letters are designated with the letter "A," individuals' letters (including those from individual members of the public and organizations) are designated by the letter "I," and oral comments received are marked as "O." For example, the second letter received from an agency was from the California Department of Transportation (Caltrans), and is identified as letter A2. Individual comments within letters are marked sequentially with numbers, such as A1-1, A1-2, etc. Copies of all letters received are provided in Appendix G and responses to each comment can be found in Appendix H. As discussed above, Section 6.3.3 contains consolidated responses (called "Common Responses") for topics on which a number of similar and related comments were received.

6.4.2 Index of Comments Received

Table 6-3 lists the agencies, organizations, and individuals that provided written comments on the Draft EIS/EIR. As described above, each comment letter and comment bears a unique identifier.

6.4.3 Common Responses

A number of the comments received on the Draft EIS/EIR discussed the same issues or environmental concerns. In accordance with the BLM NEPA Handbook (Section 6.9.2.2), similar comments may be summarized and one response given to each group of similar comments. The common issues and responses identified here and set forth below include:

Common Response 1: Decommissioning
Common Response 2: Recirculation
Common Response 3: Biological Resource PDMs
Common Response 4: Hydrologic Monitoring
Common Response 5: Groundwater Resources

TABLE 6-3
COMMENT LETTERS RECEIVED ON THE CD-IV DRAFT EIS/EIR

Comment Letter	Commenter	Page
A1	Dave Singleton, Program Analyst Native American Heritage Commission November 19, 2012	G-5
A2	Gayle J. Rosander, IGR/CEQA Coordinator California Department of Transportation (Caltrans) November 21, 2012	G-10
A3	Vince Maniaci, Chief Long Valley Fire Department January 7, 2013	G-11
A4	Matthew Lehman, Mayor Town of Mammoth Lakes January 7, 2013	G-12
A5	Tom Brown, PhD, PE, Water Resource Control Engineer Lahontan Regional Water Quality Control Board January 15, 2013	G-18
A6	Jack Truschel, Geothermal District Engineer California Division of Oil, Gas & Geothermal Development January 28, 2013	G-25
A7	Scott Burns, Director Mono County Community Development Department January 29, 2013	G-27
A8	Kathleen Martyn Goforth, Manager United States Environmental Protection Agency January 30, 2013	G-29
A9	Debra Hawk, Habitat Conservation Supervisor California Department of Fish and Wildlife January 30, 2013	G-35
A10	Gregory Norby, General Manager Mammoth Community Water District January 30, 2013	G-116
A11	Brent Calloway, Associate Analyst Mono County LAFCO January 30, 2013	G-116
I1	John Marinkovich November 18, 2012	G-119
I2	Jo Bacon January 15, 2013	G-122
I3	Jim Paulus, PhD January 16, 2013	G-125
I4	Brigitte Berman, Retired Petroleum Engineer and Geologist January 24, 2013	G-132
I5	Jeffrey and Kathleen Hansen Conspec Inc January 24, 2013	G-133
I6	Bill Taylor January 28, 2013	G-134
I7	Brian Knox Mammoth Nordic January 14, 2013	G-137
I8	Charlene Wardlow, Director Business Development Ormat January 29, 2013	G-149

TABLE 6-3 (Continued)
COMMENT LETTERS RECEIVED ON THE CD-IV DRAFT EIS/EIR

Comment Letter	Commenter	Page
I9	Adams Broadwell Joseph &Cardozo California Unions for Reliable Energy January 30, 2013	G-164
I10	John Wentworth, CEO/Board Chair Mammoth Lakes Trail Public Access January 30, 2013	G-326
I11	Malcolm Clark, Chair Sierra Club January 30, 2013	G-344
I12	Lisa Belenky, Senior Attorney Center for Biological Diversity January 30, 2013	G-351
I13	Drew Foster, Conservation Associate Friends of the Inyo January 30, 2013	G-386
I14	Richard Drury, Christina Caro LiUNA January 30, 2013	G-391
I15	Richard Drury, Christina Caro LiUNA Bishop Residents February 1, 2013	G-474
I16	Liz O'Sullivan January 27, 2013	G-476
I17	Dan McConnell February 23, 2013	G-477
O1	Public Hearing Transcript Mammoth Lakes Community Center December 5, 2012	G-478

Each section below lists the comment letter and number code for each comment for which the common response applies.

Common Response 1: Decommissioning

Commenters and Comments Addressed

Commenter	Comments
Mammoth Community Water District	A10-10, A10-15
CURE	I9-13, I9-75, I9-76, I9-114

Summary of Issues Raised

Several commenters suggest that decommissioning of the CD-IV Project is not adequately described in the Draft EIS/EIR.

Response

The Draft EIS/EIR Section 2.2.8 describes project decommissioning at a level of detail commensurate with what is generally anticipated in terms of future decommissioning activities. The project is expected to operate for a period of 30 years. During that time the Inyo National Forest may plan and implement changes to the project area and surrounding lands. Additionally, the specific make-up of decommissioning activities will depend on what the BLM, Forest Service, and GBUAPCD decide to approve (e.g., the project, one of the alternatives, some combination with conditions or not approve the project at all). Therefore it would be premature to prepare and submit a detailed Site Abandonment – Reclamation Plan at this time. The Draft EIS/EIR did analyze some generally anticipated site reclamation and decommissioning activities including the removal of project equipment and restoration of the site (e.g. Section 4.4.4.1, *Biological Resources –Wildlife*, pages 4.4-8, 4.4-14, and 4.4-19 of the Draft EIS/EIR).

The BLM will require a separate permit and supporting NEPA analysis for the reclamation and abandonment (i.e., decommissioning) of the Casa Diablo IV power plant. Section 2.2.8 states that prior to decommissioning ORNI 50, LLC would prepare a Site Abandonment – Reclamation Plan. This plan would be submitted to the BLM and Forest Service for approval prior to implementation. BLM review of the Site Abandonment – Reclamation Plan would include conducting a NEPA process to analyze potential impacts and alternatives. This process would permit public and agency input for consideration.

Common Response 2: Recirculation

Commenters and Comments Addressed

Commenter	Comments
California Department of Fish and Wildlife	A9-1
CURE	I9-2, I9-5, I9-28, I9-174
Center for Biological Diversity	I12-1, I12-20
LiUNA	I14-2
LiUNA Bishop Residents	I15-2

Summary of Issues Raised

Comments suggest that the Draft EIS/EIR needs to be revised and recirculated because it fails to establish the project's environmental setting, does not fully and fairly describe the proposed action in its project description, wholly omits a discussion of a number of potentially significant environmental impacts, and fails to adequately mitigate the project's significant adverse impacts.

Response

Under CEQ regulations, a supplemental EIS is required where there are “significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts" (40 CFR 1502.9). The *BLM NEPA Handbook* further explains when supplementation is appropriate (H-1790-1 at 5.3.1 to 5.3.2).

Pursuant to CEQA Section 15088.5

(a) A draft EIR must be recirculated when significant new information is added to the EIR after public notice is given of the availability of the draft EIR for public review under Section 15087 but before certification. The term "information" can include changes in the project or environmental setting as well as additional data or other information. New information added to an EIR is not "significant" unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement. "Significant new information" requiring recirculation include, for example, a disclosure showing that:

(1) A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.

(2) A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.

(3) A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the project, but the project's proponents decline to adopt it.

(4) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded. (Mountain Lion Coalition v. Fish and Game Com. (1989) 214 Cal.App.3d 1043)

(b) Recirculation is not required where the new information added to the EIR merely clarifies or amplifies or makes insignificant modifications in an adequate EIR.

(c) If the revision is limited to a few chapters or portions of the EIR, the lead agency need only recirculate the chapters or portions that have been modified.

(d) Recirculation of an EIR requires notice pursuant to Section 15087, and consultation pursuant to Section 15086.

(e) A decision not to recirculate an EIR must be supported by substantial evidence in the administrative record.

(f) The lead agency shall evaluate and respond to comments as provided in Section 15088. Recirculating an EIR can result in the lead agency receiving more than one set of comments from reviewers. The following are two ways in which the lead agency may identify the set of comments to which it will respond. This dual approach avoids confusion over whether the lead agency must respond to comments which are duplicates or which are no longer pertinent due to revisions to the EIR. In no case shall the lead agency fail to respond to pertinent comments on significant environmental issues.

In response to the issues raised, no substantial changes relevant to environmental concerns have been made to the Proposed Action since the Draft EIS/EIR was circulated. The revisions that have been made are reflected in FEIS/EIR Chapter 2, *Proposed Action and Alternatives,* and are limited to things like clarifying improvements to roadways, clarifications to staffing levels such as indicating that the geothermal complex would continue to be staffed 24/7 with a combination of existing and new employees (ORNI 50 LLC, 2013). These changes were previously considered but at a lower level of detail. They are not relevant to environmental concerns such that the effects of the proposed changes are still within the range of effects analyzed in the Draft EIS/EIR.

Supplemental analysis also may be prepared where the agency determines that the purposes of NEPA would be furthered by doing so (40 CFR §1506.9(c)(2)). The BLM has considered this aspect of its discretion, and concluded that the purposes of NEPA would not be furthered by recirculation in this case.

Common Response 3: Biological Resource Project Design Measures

Commenters and Comments Addressed

Commenter	Comments
Jim Paulus, PhD	I3-13
Ormat Nevada, Inc.	I8-18
Friends of the Inyo	I13-3, I13-5

Summary of Issues Raised

A number of commenters noted minor discrepancies in the wording and/or numbering of Project Design Measures related to biological resources.

Response

In response to these comments, the following revisions have been made to the Draft EIS/EIR:

(Section 2, *Proposed Action and Alternatives*, Page 2-48)

Noxious Weeds

1. ~~*BIO-4*~~*BIO-3*: 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.

2. ~~*BIO-5*~~*BIO-4*: 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.

3. ~~*BIO-6*~~*BIO-5*: 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.

4. ~~*BIO-7*~~*BIO-6*: 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.

5. ~~*BIO-8*~~*BIO-7*: 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.

(Section 4.3, *Biological Resources – Vegetation*, Page 4.3-2 and 4.3-3)

Biological Resources

1. ~~*BIO-3*~~*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

2. ~~*BIO-4*~~*BIO-3*: 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.

3. ~~*BIO-5*~~*BIO-4*: 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.

4. ~~*BIO-6*~~*BIO-5*: 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. (This measure is supplemented by Mitigation Measure VEG-2 – see Section 4.3.9 below)

5. ~~*BIO-7*~~*BIO-6*: 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 a 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.

6. ~~*BIO-8*~~*BIO-7*: 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.

Protection of Erosion and Surface Waters

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

(Section 4.3, *Biological Resources – Vegetation,* Page 4.4-3)

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

5. *BIO-5*: New non-native species introduced as a result of the ~~CD-IV~~ 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 ~~CD-IV~~ Project (this measure is supplemented with Mitigation Measure VEG-2 in Section 4.3.9, *Biological Resources* - *Vegetation*).

6. *BIO-6*: With the exception of cheatgrass, all non-native weed species already present in the ~~CD-IV~~ 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 a 3-year evaluation period following completion of revegetation measures. Weed control will be implemented immediately following implementation of the ~~CD-IV~~ Project, and throughout the ~~CD-IV~~ Project life to meet this standard.

7. *BIO-7*: 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 ~~CD-IV~~ Project completion.

Protection of Erosion and Surface Waters

HYD-1: Appropriate erosion control measures will be used to control any offsite discharges, and the ~~CD-IV~~ Project will adopt any relevant LRWQCB and USFS best management practices to prevent soil erosion, including the preparation of a SWPPP.

Common Response 4: Hydrologic Monitoring

Commenters and Comments Addressed

Commenter	Comments
Mammoth Community Water District	A10-21, A10-23, A10-24, A10-26, A10-31, A10-32, A10-35, A10-93, A10-136
CURE	I9-47, I9-48, I9-133, I9-134, I9-135
Sierra Club	I11-4, I11-7
Center for Biological Diversity	I12-9
Friends of the Inyo	I13-17, I13-18, I13-26
LiUNA	I14-8, I14-24, I14-50, I14-101

Summary of Issues Raised

Some commenters disagree with the findings of the Draft EIS/EIR on hydrologic resources and express concern that the existing Long Valley Hydrologic Advisory Committee (LVHAC) monitoring is insufficient to detect and prevent impacts of the CD-IV Project on these resources, such as drinking water resources, hot springs, creeks and fumaroles. Further, commenters suggest that the Draft EIS/EIR should incorporate mitigation measures for an enhanced monitoring program to assess potential impacts on hydrologic resources resulting from geothermal production under the CD-IV Project and that such a monitoring program should include prescriptive performance criteria and adaptive management actions to be implemented if monitoring data show that substantial adverse impacts on hydrologic resources are directly related to increased geothermal production.

Response

The BLM, USFS, and GBUAPCD acknowledge that disagreement exists regarding the Draft EIS/EIR conclusions related to CD-IV Project impacts on hydrologic resources. In preparation of the Draft EIS/EIR, the BLM relied upon the several geothermal technical experts to provide technical analyses regarding hydrologic impacts for preparation of the Draft EIS/EIR. Gene Suemnicht, Principal Geologist with EGS, Inc., summarized the voluminous body of research on the geologic and geothermal resources in the Long Valley Caldera and prepared the *Technical Geologic Overview of Long Valley Caldera for the Casa Diablo IV Geothermal Development Project* included as Appendix D of the Draft EIS/EIR. Sabohd Garg, Program Manager-Resource Technology with SAIC, Inc., independently peer-reviewed the Applicant's proprietary numerical model of the geothermal reservoir on behalf of the lead agencies to confirm its quality and usefulness for predicting future production scenarios on reservoir pressures and temperatures and presented his findings in a confidential report for the Agencies entitled *Long Valley Caldera/Casa Diablo Geothermal Reservoir Simulation Model: Peer Review*. Jill Haizlip, Principal/Senior Geochemist with Geologica Inc., provided input regarding the geochemical findings of hydrologic monitoring and overall technical review; ESA geologists Peter Hudson, P.G., Senior Technical Reviewer and Julie Moore, reviewed the technical reports, available data, and evaluated project impacts based on their professional expertise.

The lead agencies independently have considered the information provided by their team of qualified experts and, on the basis of this and other evidence, have concluded that the CD-IV Project would not have a substantial impact on hydrologic resources and, therefore, mitigation measures are not warranted. These conclusions notwithstanding, the lead agencies did consider whether additional monitoring would benefit the quality of the human environment, and concluded that development of separate, additional monitoring of hydrologic resources requirements in the EIS/EIR was unwarranted and would be redundant with the existing Long Valley Hydrologic Advisory Committee (LVHAC) hydrologic monitoring program and BLM Conditions of Approval[1] for the CD-IV Project. The Draft EIS/EIR Section 4.7, *Geothermal and*

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1 As noted in Section 1.2, the BLM will issue a Record of Decision to approve, approve with conditions, or deny the application filed by ORNI 50, LLC for a Geothermal Drilling, Commercial Use, Site License and Construction Permit. Permit Conditions of Approval determined necessary by the BLM would be requirements for project approval and set forth in a mitigation and monitoring plan.

Groundwater Resources, pages 4.7-9 and 4.7-12, describes the anticipated expansion of the LVHAC monitoring program for the CD-IV Project. Additional information regarding the LVHAC, hydrologic monitoring requirements, and expected permit Conditions of Approval is provided below for further clarification.

In response to the development of geothermal resources at Casa Diablo, the LVHAC was established in the mid-1980s to provide guidance to the BLM and Mono County regarding potential effects of geothermal production on hydrologic resources, such as shallow cold groundwater, fumaroles, hot springs, and streams in the project area. The LVHAC members include the BLM, USFS, USGS, CDOGGR, CDFW, Mono County and the geothermal developers. Thermal and nonthermal subcommittees of the LVHAC meet with developers to discuss both public and proprietary monitoring and development data and interpretive analyses of such information. Through a cooperative agreement, the USGS performs sampling, attends LVHAC meetings, and provides compilations of monitoring data. The Draft EIS/EIR Figure 3.7-4 presents the USGS monitoring points in Long Valley. Hydrologic monitoring for more than 25 years has provided extensive data and further understanding regarding the relationship between the geothermal and hydrologic resources. While the LVHAC itself is an advisory committee and has no regulatory authority, it reviews and provides recommendations on mitigation alternatives to its member agencies which do have authority to enforce regulations and permit conditions. Currently, Mono County and BLM have oversight of the MP-2 and PLES I geothermal projects, respectively, in Casa Diablo. Permit conditions outlined in their respective mitigation and monitoring plans require periodic review of hydrologic monitoring results, drilling of additional monitoring wells if needed, and implementation of remedial action measures if required to prevent or mitigate potential hydrothermal impacts to the Owens tui chub critical habitat, Hot Creek Hatchery, and Hot Creek Gorge springs. If monitoring information indicates that (1) pressure, temperature, and/or chemical changes or trends are occurring within the production or injection fields in excess of the anticipated variations, based on production experience; (2) pressure, temperature, and/or chemical changes or trends are occurring within the monitoring well(s) in the excess of the anticipated range of variations; or (3) plant operations may threaten an unacceptable impact to other current beneficial uses of thermal water, or threaten a change in the temperature of the AB or CD Hot Creek headsprings, then the operator shall immediately implement one or more of the following mitigation actions: temporarily modify the production and/or injection of geothermal fluids within the field and monitor the reservoir response. Modification could include one or more of the following: change fluid volumes or pressures in one or more production or injection well(s); discontinue use of one or more production or injection well(s); change the depth of injection; relocate one or more production or injection well(s); any other measure as directed by the authoring officer; permanently modify the production and/or injection program; or reduce or discontinue power production. Additional remedial action measures include providing an alternate source of thermal water to the affected Hot Creek headsprings and injection of geothermal water into the geothermal reservoir upgradient of Hot Creek Gorge.

Historic monitoring provides ample evidence that hydrologic resources are affected by a variety of factors, such that changes in water levels and temperature are often difficult to correlate as a response to geothermal production. For example, climatic factors have been primarily responsible for observed changes at hydrologic features. The LVHAC acknowledges the complexities of the geothermal reservoir and related hydrologic system and thus regularly reviews the monitoring data, particularly when production or injection is altered, evaluates related factors contributing to hydrologic changes, and provides flexibility for adaptive response as needed, with a regulatory mechanism for enforcement, as described above. The dynamic nature of geothermal development, regional seismic activity, and climatic changes necessitate collaborative review of hydrologic monitoring results, as currently performed by the LVHAC, and suggest that formulation of a prescriptive approach for monitoring up to 30 years in the future cannot effectively predict the variables and potential responses that could be needed.

At the February 2013 LVHAC thermal subcommittee meeting, attended by the BLM, USFS, USGS, DOGGR, Mono County, and Ormat, members discussed the potential impacts of the proposed CD-IV Project and whether the existing hydrologic monitoring network was adequate to detect potential impacts on hydrologic resources, in particular MCWD groundwater resources. Based on the LVHAC discussions and concerns raised in public comments, the BLM requested that the LVHAC review the current monitoring program and provide an opinion as to whether the program is adequate to monitor the proposed geothermal expansion related to the CD-IV Project, including potential effects on the drinking water aquifer. Furthermore, the BLM requested that if the LVHAC believes that the current monitoring program is inadequate to monitor the proposed CD-IV Project, the LVHAC provide recommendations on how the monitoring program could be modified to be adequate. The USGS and LVHAC advisory members will provide their technical advice, and the BLM would determine appropriate Conditions of Approval to include with the proposed Commercial Use Permit for the CD-IV Project, if approved.

The BLM’s permit Conditions of Approval for the development of the CD-IV Project would include mandatory conditions requiring compliance with an expanded LVHAC hydrologic monitoring program, periodic review and assessment of the monitoring program, and potential recourse actions in the event substantial adverse effects on hydrologic resources resulting from project operation are identified.

In summary, the Draft EIS/EIR conclusions regarding potential impacts on geothermal resources are supported by the presented technical analysis. Additional monitoring and adaptive management resulting from an expanded LVHAC program are intended to address the uncertainty associated with a dynamic geothermal system, and may result in Casa Diablo IV development or operational changes as part of permit conditions.

Common Response 5: Groundwater Resources

Commenters and Comments Addressed

Commenter	Comments
MCWD	A10-1 to A10-8, A10-26 to A10-140
Town of Mammoth Lakes	A4-28
LiUNA	I14-12, I14-73
Sierra Club	I11-8

Summary of Issues Raised

Comments question the adequacy of the Draft EIS/EIR, asserting that it lacks critical information necessary to evaluate the CD-IV Project's potential impacts on groundwater resources. In particular, the MCWD suggests that geologic mapping and cross-sections presented in the Draft EIS/EIR do not present sufficient data to support the conclusion that the geothermal reservoir and drinking water aquifer are physically separate and not hydraulically connected; historic well monitoring does not conclusively indicate a lack of hydraulic connection; the numeric model used to forecast the geothermal reservoir pressure and temperature response to geothermal production does not represent the area in which MCWD wells are located; and increased production could have a negative effect on Mammoth Creek and hydrothermal input to Hot Creek Fish Hatchery, hot springs, and fumaroles.

Response

The BLM and Forest Service took a hard look at the impacts of the CD-IV Project on groundwater resources to satisfy the applicable requirements under NEPA. The level of detail considered and documented in the EIS/EIR is sufficient to support reasoned conclusions based on quantitative or detailed qualitative information about the amount and the degree of change to the affected environment that would be caused by the Proposed Action and alternatives. (See, e.g., Draft EIS/EIR Section 3.7, Affected Environment, *Geothermal and Groundwater Resources*; Section 4.7, Environmental Consequences, *Geothermal and Groundwater Resources*; and Appendix D, *Technical Geologic Overview of Long Valley Caldera for the Casa Diablo IV Geothermal Development Project,* report prepared by EGS, Inc.; see also, Final EIS/EIR Figures 1-4 included in this Common Response.) For example, preparation of the Draft EIS/EIR included the review of voluminous studies on the Long Valley geothermal area by geothermal technical experts who are knowledgeable of the geology, hydrogeology, and geothermal activity in the project area. Data reviewed for the Draft EIS/EIR analyses included well boring logs, subsurface lithologies, geochemical studies, LVHAC monitoring data, MCWD's groundwater model report and annual monitoring reports. The presentation of the supporting data and analysis of project impacts are detailed in the Draft EIS/EIR and Appendix D.

The analysis of project impacts presented in the Draft EIS/EIR relies upon the technical data developed through the research and analysis completed by EGS. The Draft EIS/EIR findings are supported by the data reviewed and referenced by the technical experts, including the following: Gene Suemnicht, Principal Geologist, EGS, Inc.; Sabodh Garg, Program Manager – Resource Technology, Science Applications International Corporation (SAIC); Jill Haizlip, Senior Geochemist, Geologica, Inc.; Peter Hudson, P.G., Senior Technical Associate, Environmental Science Associates; Julie Moore, Technical Associate, Environmental Science Associates; Margie de Rose, Geologist, United States Forest Service. While the additional figures and cross-sections suggested by MCWD might augment and/or simplify the Draft EIS/EIR analysis, they do not change the Draft EIS/EIR conclusions regarding the potential impact on groundwater resources. This and other evidence in the record also supports the Great Basin Unified Air Pollution Control District's significance determinations under CEQA.

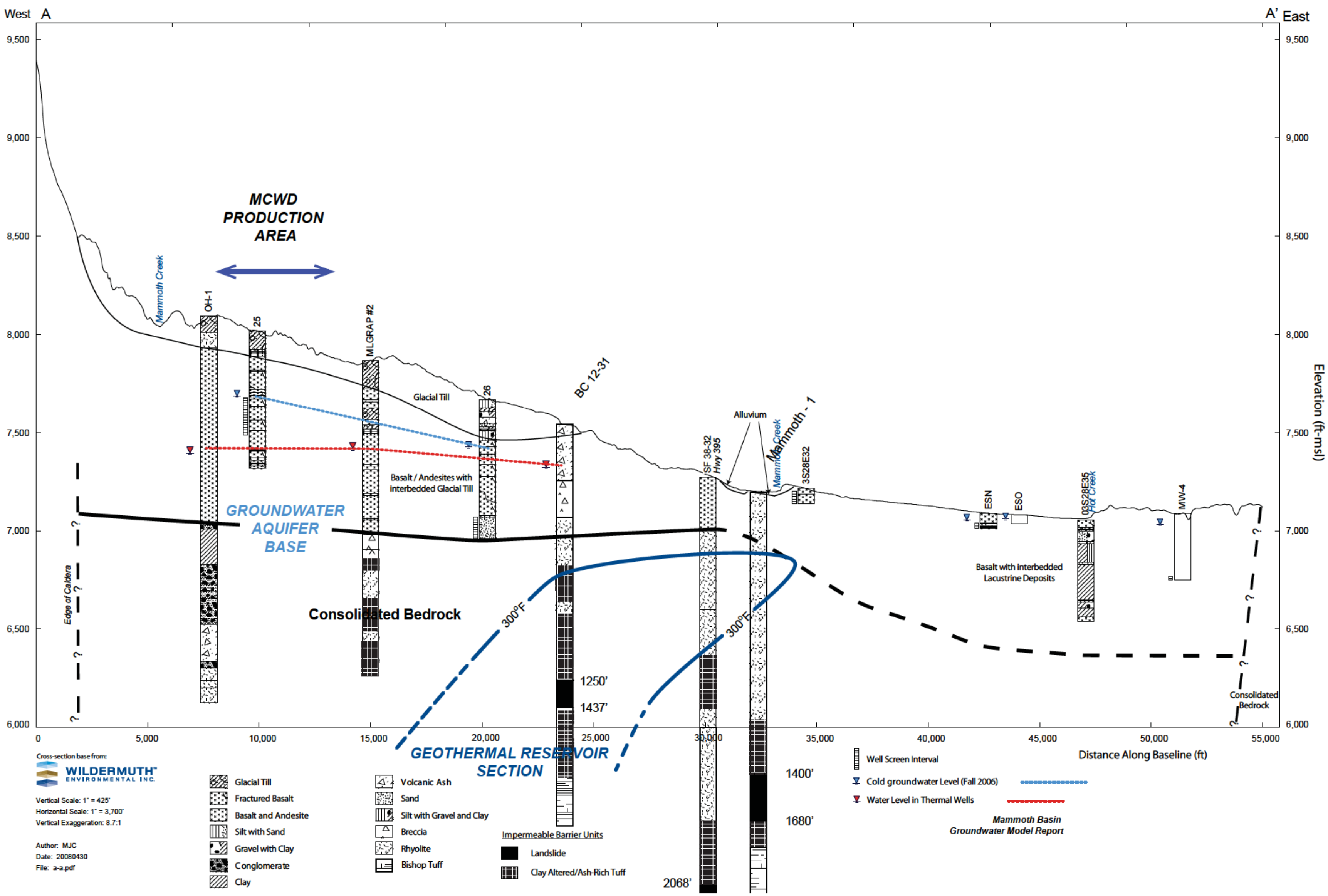
The analysis documented in the Draft EIS/EIR adequately addresses potential impacts on groundwater resources. However, acknowledging the level of MCWD and public concern regarding groundwater quality and availability, additional information is provided below regarding the various lines of evidence supporting the conclusion that there is a separation between the groundwater resources and the geothermal system. This evidence includes the following: geologic factors, such as stratigraphy, specific lithologies, alteration and mineralization of rock units; results of historic monitoring of shallow groundwater resources; geochemistry, including isotopic data; and temperature data.

Separation of Groundwater Resources and the Geothermal System: Geologic Setting

Separation from cold groundwater is a fundamental concept of the geothermal system. Without separation from overlying cold groundwater, the hot geothermal system could not exist; it would be quenched by the infiltration of cold waters. The Draft EIS/EIR (page 4.7-10) states that the shallow cold groundwater aquifers and geothermal system have different host rocks and are separated by intense alteration of Early Rhyolite beneath the unconformity to mostly impermeable clays, as shown in the MCWD groundwater model cross-section (Wildermuth, 2009) reproduced as Draft EIS/EIR Figure 3.7-6. The consolidated bedrock shown on Figure 3.7-6, considered the base of the groundwater aquifer, is the beginning of an impermeable layer. This cross-section is extended in depth to demonstrate the lithologies encountered in the deeper geothermal wells (Figure 1).This information was shown on the lithologic columns presented in Appendix D, Figure 35. Figure 2 shows the location of MCWD wells, geothermal exploration wells, gradient holes, and the CD-IV project area.

The separation between the groundwater and geothermal systems is not a function of a single element because the aquifers in the Mammoth Groundwater Basin and the underlying deeper geothermal system are complex and have differing geologic histories. Numerous local groundwater and regional geothermal resource investigations have established the lateral and vertical extent of many different geologic units within Long Valley Caldera. Based on these investigations, the separation between the shallow cold groundwater aquifers and the deeper geothermal system is controlled by of a combination of stratigraphy, specific lithologies, and the degree of alteration or mineralization related to past and present hydrothermal circulation.

Stratigraphic Relationships. The stratigraphic units that comprise the Mammoth Groundwater Basin aquifers are all less than 200,000 yrs old and are characterized as glacial till and unconsolidated alluvium (shallow groundwater system) that overlay fractured water-bearing volcanic rock and interstratified glacial till in the lower portion of the western basin. In the eastern portion of the groundwater basin, the same fractured water-bearing volcanic/till section is exposed and intercalated with a varying section of alluvial and lacustrine units. Older (Paleozoic) metamorphic rocks, Bishop Tuff (760,000 yrs) and Early Rhyolite (600,000 yrs) are the consolidated bedrock underlying the water-bearing sediments of the Mammoth Groundwater Basin and act as the effective base of the aquifer (Figure 1, cross section). The current actively convecting, high-temperature geothermal system in Long Valley occurs in deep fractured metamorphic rocks and the Bishop Tuff at significant depths (more than 2000 feet) in the western caldera. Upflow from this western system supplies outflow along faults and fractures in laterally



SOURCE: Wildermuth 2009, EGS, 2013.

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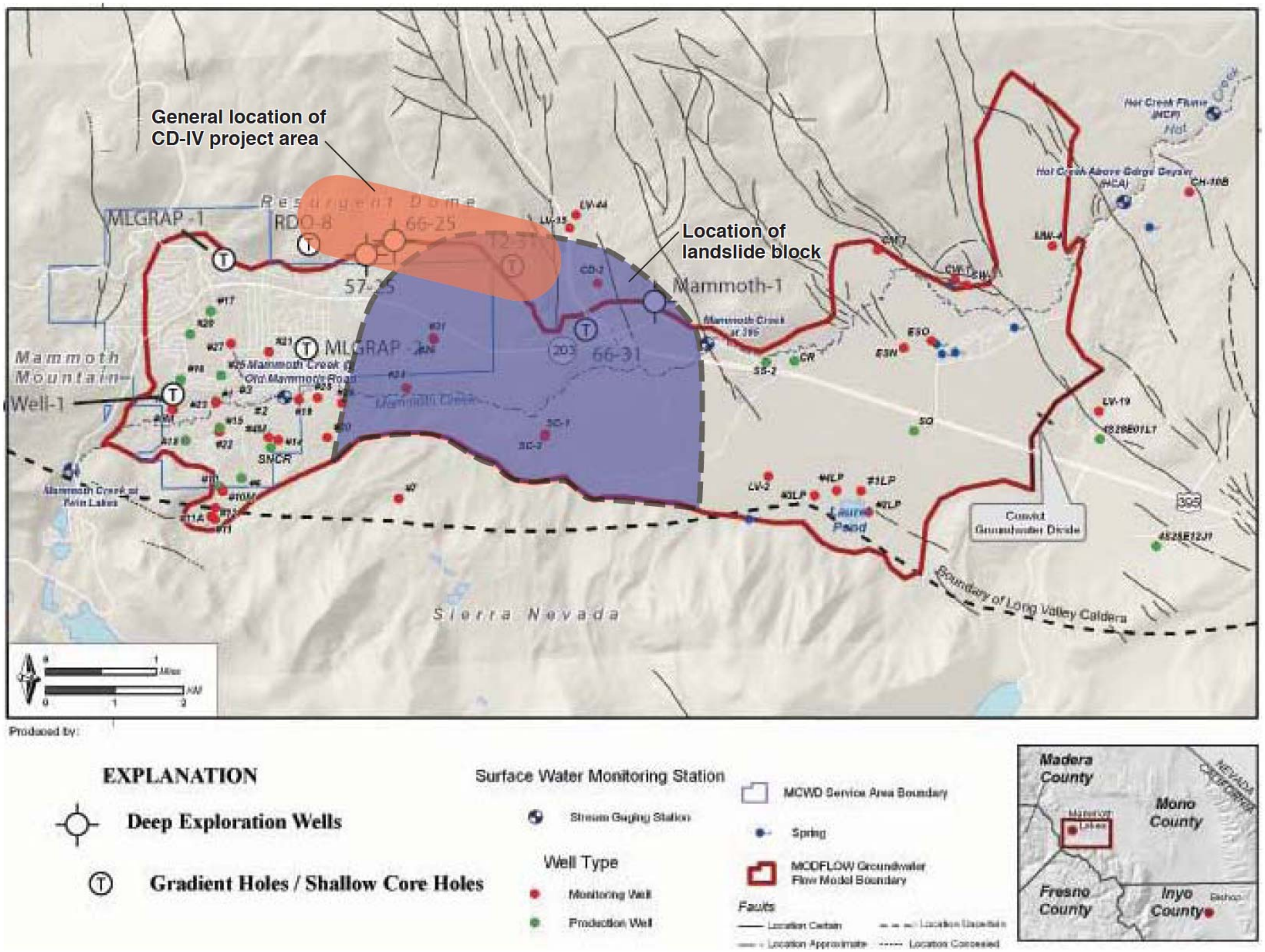
Figure 1
Cross Section A-A'



SOURCE: Wildermuth Environmental, 2009; EGS, 2013.

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Figure 2
Mammoth Community Well Locations, Deep Explorations Wells, and CD-IV Project Area

(but not vertically) hydraulically continuous units to lower elevations in the east, where the unconfined shallow groundwater system comingles with shallow outflow from the geothermal system. The stratigraphic sections are thickest in the west. Thick (1000 – 2000 foot) ash-rich Early Rhyolite pyroclastic units overlie the upwelling geothermal system in the west and act as a significant barrier constraining outflow into units with a high degree of lateral continuity within the relatively shallow geothermal system beneath the south moat.

Specific Lithologies. Part of the deeper stratigraphic section includes a landslide block (see cross section, Figure 1) of metamorphic rocks that slid into the caldera at the end of the Bishop Tuff eruption on a gas-rich cloud of ash that underlies and in some places encases the landslide. The landslide block is shown on Draft EIS/EIR Figures 3.7-2 and 3.7-3, and Appendix D Figure 35. This impermeable landslide block is one, but not the only, control on the vertical distribution of shallow hydrothermal fluids between Casa Diablo and Shady Rest. The current scheme of shallow (approximately 600 feet) production and deeper (approximately 2000 feet) injection at Casa Diablo is successful specifically because injection is placed beneath the impermeable landslide block, effectively isolating production from cold recharge and injection fluids that might quench the system. Wells also penetrate the landslide block in the western caldera (see cross section) still limiting upflow from the deeper Bishop Tuff geothermal reservoir and isolating the system from the effects of cold water incursion.

Alteration and Mineralization. As discussed in the Draft EIS/EIR (page 3.7-2), geothermal systems commonly alter the rocks they circulate through, depositing minerals and enhancing or forming a surrounding barrier or cap limiting the vertical and lateral circulation of hot water and maintaining convective fluid circulation in a permeable geothermal reservoir at depth. The cooling Bishop Tuff magma chamber supported an intense hydrothermal system, from 300,000 to 130,000 years ago and later intrusions in the western caldera led to the current hydrothermal system that has probably been active for only the last 40,000 years (Sorey and others, 1991). Alteration mineralogy for several relict outflow zones shows that significant surface manifestations occurred at higher elevations in the western caldera in the early phases of the current hydrothermal system. The current pattern of outflow to the southeast toward Casa Diablo is likely the result of active fracturing and faulting opening older hydrothermal flow zones, allowing outflow along permeable zones at lower elevations (Suemnicht and others, 2007). That means that older rocks have been affected by at least two hydrothermal systems. Consequently, two hydrothermal events have affected the thick impermeable pyroclastic ash that makes up as much as 50-80 percent of the 600,000 year old Early Rhyolite section in the western caldera, altering and mineralizing thick ash sections to clay and forming even more effective barriers to vertical flow.

Because of this combination of geologic factors, in modeling the shallow Mammoth Basin groundwater system to evaluate management alternatives Wildermuth (2009) stated:

> "Local geothermal extraction and injection operations related to existing and potential expanded future operations were not modeled as part of this study as existing publicly available studies and data do not indicate significant interaction between the upper cold water aquifer and the much deeper geothermal reservoir."

Historic Monitoring of Shallow Groundwater System

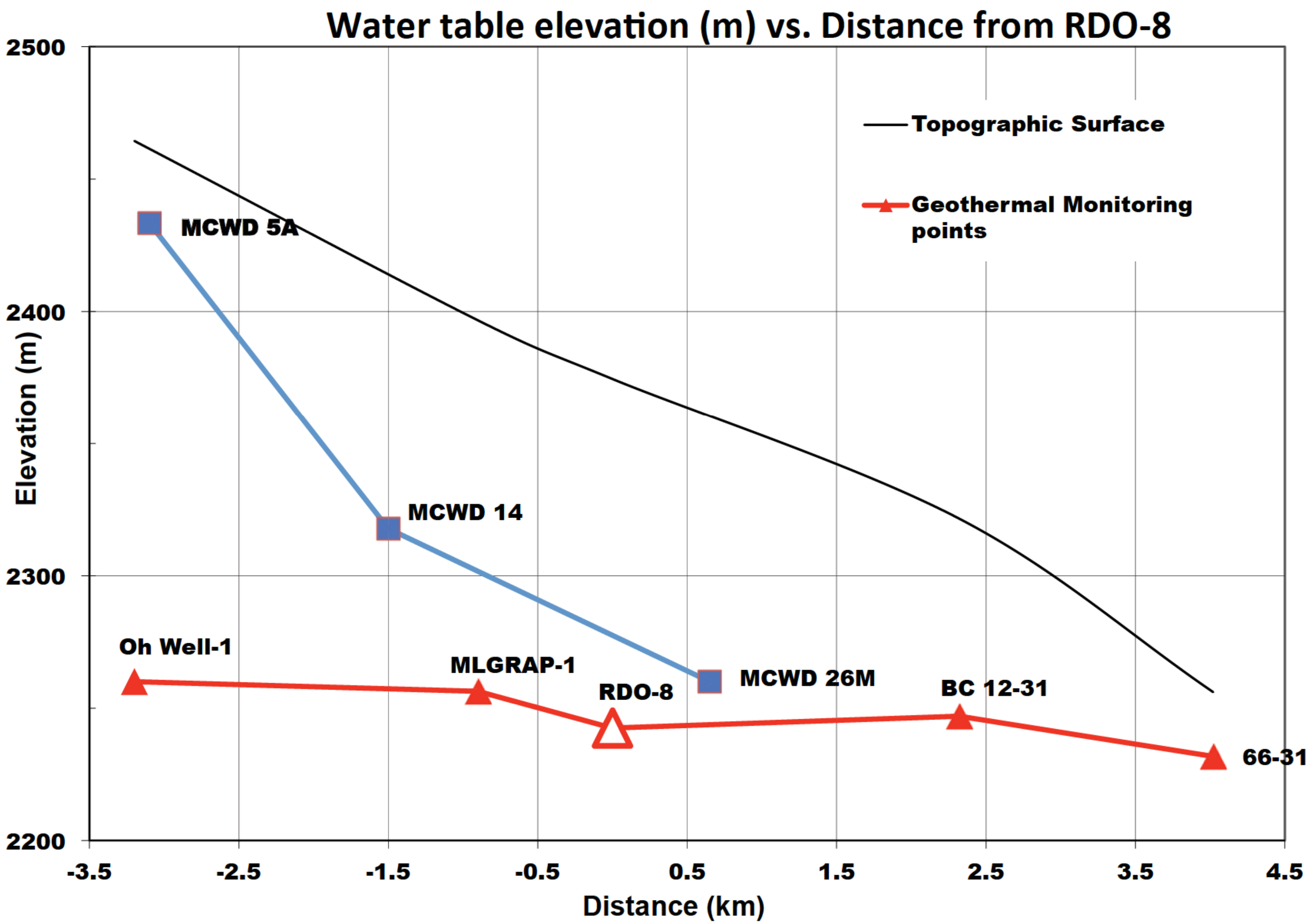
As discussed in the Draft EIS/EIR on page 4.7-10, LVHAC monitoring includes three shallow groundwater wells. Historical pressure readings at these monitored wells show little response to noticeable pressure changes within the geothermal reservoir. Appendix D Figure 36 presents monitoring results for the shallow groundwater system that illustrate the lack of response to the startup of production in Basalt Canyon in 2006. As discussed, shallow cold groundwater monitoring demonstrates the effects of proximity to recharge sources, seasonal recharge variations and long-term climate patterns.

Hydrologic data substantiates the separation of the shallow cold groundwater system and the underlying high temperature geothermal system in the western caldera moat in Long Valley. As discussed in the Draft EIS/EIR, the shallow groundwater generally follows topography, while the deeper geothermal reservoir water level is generally stable. Based on shallow and deep well data, the piezometric (water elevation) surface of the deeper geothermal system has long been recognized as quite different and, therefore, separate from the shallow cold groundwater system (Farrar and others, 2003). This is shown on the attached cross-section Figure 1 and groundwater elevation data graph Figure 3.

The MCWD has not permitted the LVHAC to sample its wells until 2011; therefore, there is little historical data from MCWD wells in the LVHAC monitoring program. Annual monitoring reports for MCWD groundwater wells provide no indication that a drawdown in water levels has occurred related to the onset of geothermal production in Basalt Canyon, and the MCWD has not informed the LVHAC of such concerns. The most recent MCWD annual monitoring report (Schmidt, 2013) indicates that a water level decline was “primarily due to decreased recharge during dry years.”

In contrast, MCWD Comment A10-109 states that MCWD Well No. 26 has shown a noticeable drawdown since 2008 and suggests that this could be due to geothermal production in Basalt Canyon. Because this is the closest MCWD well to the Basalt Canyon area, the comment asserts that the water level monitoring results should have been evaluated in the Draft EIS/EIR. Figure 4 presents a hydrograph of MCWD Well 26 water elevations (from MCWD annual reports prepared by the commenter), precipitation measured by the USFS at Mammoth Ranger Station, and the startup date of sustained production of the Basalt Canyon portion of the geothermal reservoir. As shown, water level declines appear to be largely related to rainfall, as reported in the MCWD annual monitoring report. The monitoring report page 41 (Schmidt, 2013) describes the water elevation declines and rises during the period of June 2006 to September 2012 and concludes “the water level changes in this well are due to the extent of recharge.” This conclusion is similar to those for other groundwater wells. Water levels in this well recovered to within 2 feet of the initial levels between 2010 and 2012 during full-scale production from Basalt Canyon. As discussed in the Draft EIS/EIR and Appendix D, the dominant influence on water levels in shallow groundwater appears related to climatic/seasonal variations.

In order for Basalt Canyon production to induce the downward flow of cold groundwater into the geothermal system, connectivity between the two aquifers and a large pressure decline in the geothermal reservoir would be required. The targeted production zones in Basalt Canyon are



SOURCE: Farrar 2004; Diment + Urban 1990; USGS LVHAC Hydrologic Monitoring Data 2006 & 2007; MCWD Annual Monitoring Data

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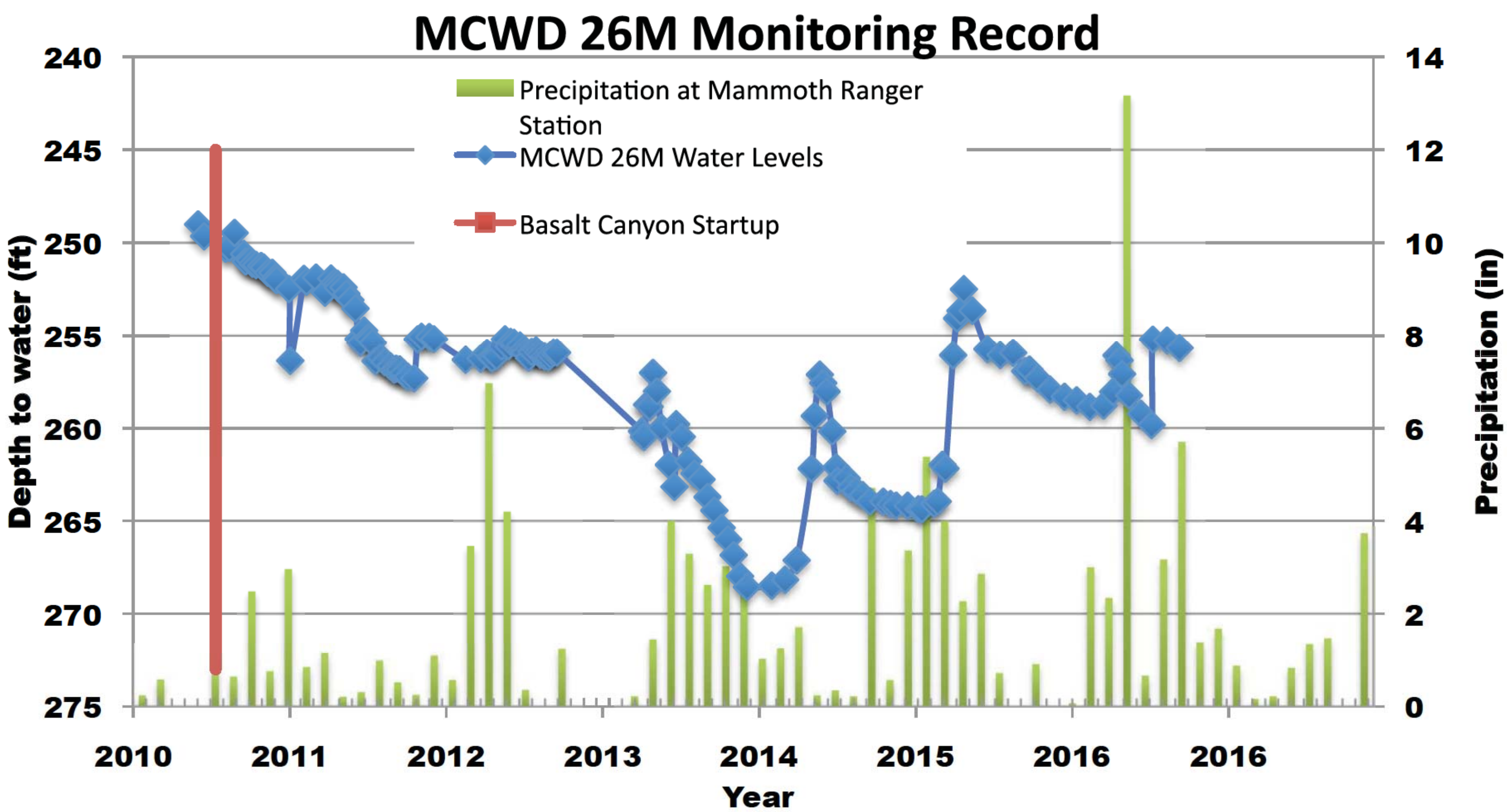
Figure 3
Water Elevations in Groundwater and Geothermal Monitoring Points



SOURCE: Schmidt, 2013 Annual Report on Results of Mammoth Community Water District Groundwater Monitoring Program, January 2013

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Figure 4

Water Levels in MCWD Well 26M and Precipitation substantially deeper than current production zones at Casa Diablo, providing a greater separation between the shallow groundwater aquifer and the deeper geothermal production zone. One of the goals of geothermal production is to balance production with injection to avoid large pressure drops, which would be detrimental to the production. Pressure declines predicted for the CD-IV Project are less than those that have been observed to date at Casa Diablo, with no negative effects on groundwater levels.

MCWD has expressed concerns regarding monitoring for the potential drawdown of groundwater related to geothermal production. Evidence for the possible movement of shallow cold groundwater into the geothermal system would be detected in temperature, pressure, and chemistry of produced geothermal fluids. These parameters are routinely monitored by the geothermal producer and the LVHAC. As discussed in the Draft EIS/EIR, temperature declines at Casa Diablo (a much shallower reservoir) in the 1980s were partially attributed to an influx of cold groundwater based on geothermal fluid chemistry. As a result, geothermal production has shifted west to a deeper zone in Basalt Canyon, which provides greater separation from the cold groundwater that could quench the geothermal system.

Geochemistry and Isotopic Data

As discussed in the Draft EIS/EIR Section 4.7.4.1, the chemical signature of geothermal fluid is distinct from that of groundwater. The ratio of chloride/boron and comparisons of the stable isotopes deuterium and oxygen-18 have been used to identify geothermal waters. Geochemical data shows no consistent evidence of mixing between thermal and non-thermal waters beneath the western part of the caldera. While the preponderance of data supports this conclusion, recent, isolated sampling discussed in the Draft EIS/EIR has detected the presence of chloride in one groundwater well (Well P17) at concentrations about 100 times lower than typical of geothermal waters. This outlier has been used by MCWD and others to suggest widespread mixing of geothermal fluid is occurring. This argument ignores the substantial contrary data and is inconclusive. The presence of chloride may be, but is not definitively, a result of geothermal fluid inflow. Elevated chloride concentrations in groundwaters sampled on the north base of Mammoth Mountain show a wide range of chloride values as a result of additions of salt to the snow surface on the lower sections of a few ski runs. Sorey (2011) cautions against reaching conclusions based on chloride concentrations because “measured concentrations of chloride and other conservative cations for the MCWD wells are most likely to be low enough that they are close to, and influenced by, the limits of laboratory accuracy and precision for these elements.” The overall conclusion of this study is that “there appears to be no reliable evidence of effects of **25 years of geothermal development on water level or fluid chemistry in the MCWD production wells** [original emphasis]. The possibility of fluid upflow along fault-related conduits between the thermal flow system tapped at depths of ~500m seems unlikely because of a lack of any effects such a process would cause on the chemistry (increasing concentrations and ratios of conservative ions) of produced fluids from the MCWD wells in the northwest part of the Mammoth Basin.”

Temperatures

As discussed in the Draft EIS/EIR the temperature of water in the shallow cold aquifer and the geothermal reservoir are quite distinct. As discussed in Sorey (2011), the magnitude of subsurface fluid temperature and chemistry depend upon (1) the length and depth of fluid flow paths from recharge areas to discharge areas (e.g. production zones), (2) rock types hosting the flow paths, and (3) rates and amounts of heat input from rocks along the flow paths, especially in the case of the presence or absence of cooling magmatic bodies in proximity to the fluid flow paths.

It is noted in the Draft EIS/EIR, however, that five MCWD wells have somewhat elevated temperatures. The MCWD asserts that these temperatures are indicative of mixing with geothermal fluid. In order for the elevated temperature to be the result of mixing with geothermal fluid, the groundwater must also display the geochemical signature of geothermal fluids (discussed above). Where higher water temperatures correlate with identification of chemistry of thermal water (for example there is a linear positive relationship between temperature and thermal components such as chloride or sodium), the source of the temperature is attributed to the mixing of thermal water and non-thermal water. Where water temperatures are higher but there are no traces of geothermal fluid chemistry in the water, the source of the elevated water temperature is attributed to conductive heating of water by flowing through hot aquifer rocks. Refer to the Response I14-22 for further discussion of the concept of conductive heating. With one possible exception (Well P-17) the waters encountered in wells along the northeastern side of the Mammoth Groundwater Basin have higher temperatures but no trace of geothermal chemistry and thus the source of the temperature is most likely conductive heating. While it may be a concern, conductive heating in shallow aquifers on the northeastern side of the Mammoth Groundwater Basin cannot be affected by the CD-IV Project.

Geothermal System Numeric Model

The Draft EIS/EIR discusses the proprietary numeric model developed for the CD-IV Project. The model was created expressly for the purpose of evaluating the conditions within in the Bishop Tuff geothermal reservoir in Basalt Canyon and for the managing production and injection program. The model, based on the current understanding of the physical system and historic reservoir response, is the best available tool for conducting a reasonable evaluation of future impacts. As discussed in the Draft EIS/EIR, the model predicts the overall temperature and pressure response of the Basalt Canyon geothermal reservoir to production scenarios. Model results indicate that reservoir pressures would decline from 1.45 to 10.2 pounds per square inch and temperatures of produced fluids would decline about 18^{o}F (10^{o}C), over the 30-year life of the project with continued production from existing Casa Diablo facilities. Because the geothermal reservoir is measurably interconnected with the hydrologic features to the southeast of the caldera, corresponding flow and temperature declines in these features, e.g., Hot Creek Fish Hatchery Springs, were calculated in the Draft EIS/EIR. Flow, drawdowns, or temperature changes for groundwater resources in the Project area, on the other hand, were not calculated from the model’s predictions of pressure and temperature declines in the geothermal reservoir, because there is no indication that the shallow groundwater responds to geothermal reservoir pressure and temperature changes. Disclosure of proprietary information on numeric model assumptions, calibrations, and simulations, as requested by MCWD, would not provide additional insight on the separation between the groundwater aquifer and the geothermal reservoir.

Summary

Many of the individual comments reflect a selective use of information, ignore overall data trends, and reflect an incomplete understanding of the geologic setting, the Long Valley geothermal system, the findings of historic monitoring, and geothermal development and operation. In addition, MCWD concerns regarding additional monitoring could be discussed with the LVHAC. As discussed, any cold water influence or change in producing conditions would be noticed very quickly in the temperature and pressure data for the geothermal system that are continually monitored by the geothermal developer for the LVHAC. These data are critical because it is in the developer's interest to maintain optimal production of the hydrothermal resource.

As discussed in this response, the Draft EIS/EIR and Appendix D provide a summary of the extensive data accumulated in over 30 years of study on the Long Valley Caldera. As discussed in this response, the Draft EIS/EIR, its technical appendix and supporting documents provide substantial evidence to support the impact analysis and conclusions related to MCWD's concerns on groundwater resources. The lead agencies also thoroughly reviewed and carefully considered the data and other information provided in MCWD's comments. The additional cross-sections, maps, and hydrologic monitoring data provided in this response to clarify the geologic, hydrologic and geochemical studies reviewed for the Draft EIS/EIR do not change the conclusions reached in the Draft EIS/EIR as to the significance of potential impacts to groundwater resources.

6.5 Administrative Remedies

BLM, USFS and USEPA's Office of Federal Activities will publish separate NOAs for the Final EIS/EIR in the Federal Register when the document is ready to be released to the public. The Final EIS/EIR will include the agencies' preferred alternatives.

The agencies will publish separate Records of Decision (RODs) for the CD-IV Project no sooner than 30-days after publication of the Final EIS/EIR (40 CFR 1506.10(b)). Publication of the BLM ROD will initiate a 30-day appeal period to the Interior Board of Land Appeals (IBLA), Office of the Secretary, in accordance with 43 CFR Part 4.

Publication of the USFS ROD will initiate a 45-day appeal disposition period. If appeals are received, the USFS conducts an appeal resolution process after which the USFS must affirm or reverse its decision.

The GBUAPCD will also file an NOC with the state clearing house when the Final EIS/EIR is ready to be released to the public. This will initiate a 10-day period (Pub Res. Code 21092.5) before the GBUAPCD board can consider the project. Following a GBUAPCD board hearing, the GBUAPCD would file a Notice of Determination (NOD) with the State Clearing House initiating a 30-day appeal period.

CHAPTER 7
List of Preparers

7.1 Lead Agencies

Bureau of Land Management

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Collin Reinhardt	CD-IV Project Lead, Geologist
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Bernadette Lovato	Field Manager Bishop Field Office
James Haerter	Geologist
Mike Lystad	Petroleum Engineer Technician
Sandra McGinnis	Environmental Protection Specialist
David Jones	Physical Scientist
Colin O’Brien	Planning and Environmental Coordinator
Janell Bogue	Attorney Advisor
Dylan Fuge	Attorney Advisor
Robert Foxworth	Archaeologist
Greg Haverstock	Archaeologist
Tony Overly	Archaeologist
Sherri Lisius	Wildlife Biologist

United States Forest Service, Inyo National Forest

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Sarah Tomsky	Deputy District Ranger
Adrienne Dunfee	Assistant Forest Engineer
April Barron	Rangeland Management Specialist
Katy Rich	Landscape Architect
Richard Perloff	Wildlife Biologist
Lisa Sims	Fisheries Biologist and Aquatic Program Manager
Sue Weis	Botanist
Sarah Johnston	Heritage Program Manager
Erin Noesser	Hydrologist
Todd Ellsworth	Physical Scientist
Sheila Irons	Lands Specialist
Jon Kazmierski	District Recreation Officer
Susan Joyce	Forest Planner

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CHAPTER 8
Acronyms and Abbreviations

$\mu g/m^3$	micrograms per cubic meter
°C	degrees Celsius
°F	degrees Fahrenheit
%	percent
A	ampere (amp)
AADT	Annual Average Daily Traffic
AAQS	ambient air quality standards
AB 32	California Global Warming Solutions Act of 2006
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ABM	automatic bottle machine
ACHP	Advisory Council on Historic Preservation
ACTM	Airborne Toxic Control Measure
AEP	annual exceedance probability
AIRFA	American Indian Religious Freedom Act
a.m.	ante meridiem
amsl	above mean sea level
AP	Alquist Priolo
APE	Area of Potential Effects
APM	Applicant Proposed Measures
ASCE	American Society of Civil Engineers
AST	aboveground storage tank
ATV	all-terrain vehicle
BA	Biological Assessment
BE	Biological Evaluation
bgs	below ground surface
bhp	brake-horsepower
BLM	United States Bureau of Land Management
BLMS	BLM Sensitive
BMPs	best management practices
BO	Biological Opinion

BOPE	"blowout" prevention equipment
BP	Before Present
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent System Operator
CALFIRE	California Department of Forestry and Fire Protection
CalARP	California Accidental Release Program
CA DOF	California Department of Finance
CalEPA	California Environmental Protection Agency
Cal-IPC	California Invasive Plant Council
Cal/OSHA	California - Occupational Safety and Health Administration
Caltrans	California State Department of Transportation
CARB	California Air Resources Board
CBC	California Building Code
CCR	California Code of Regulations
CD-IV	Casa Diablo Geothermal Development Project
CDC	seismic design category
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CDP	Census Designated Places
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CH_4	methane
CHP	California Highway Patrol
CMP	Congestion Management Plan
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide-equivalent
CPUC	California Public Utilities Commission
CREST	Carson Ridgecrest Eastern Sierra Transit

CRHR	California Register of Historical Resources
CUP	Conditional Use Permit
CUPA	Certified Unified Program Authority
CWA	Clean Water Act
dB	decibels
dBA	A-weighted decibel scale
dbh	diameter at breast height
DCS	digital Control System
DHS	California Department of Health Services
DNA	Determination of NEPA Adequacy
DOI	United States Department of Interior
DPM	diesel particulate matter
DRECP	California Desert Renewable Energy Conservation Plan
DSN	Desert Side-Notch
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
EDD	California Employment Development Department
EFZ	Earthquake Fault Zone
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EO	Executive Order
EP Act	Energy Policy Act of 2005
EPCRA	Emergency Planning and Community Right-To-Know Act of 1986
EPS	Emission Performance Standard
ESA	Environmental Science Associates
ESTA	Eastern Sierra Transit Authority
FAA	Federal Aviation Administration
FACW	Faculative Wet
FC	Candidate for listing by the Federal Government
FE	Federally listed as endangered
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
FGC	Fish and Game Code
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act
FMMP	Farmland Mapping and Monitoring Program

FR	Federal Register
FSS	Forest Service Sensitive
FT	Federally listed as threatened
FTA	Federal Transit Administration
FYPC	Fossil Yield Potential Classification
GBUAPCD	Great Basin Unified Air Pollution and Control District
GBVAB	Great Basin Valleys Air Basin
GHG	greenhouse gas
GIS	Gas-insulated switchgear
gpd	gallons per day
gpm	gallons per minute
GRO	Geothermal Resources Operational
GWh	gigawatt-hour
GWP	Global warming potential
GWR	groundwater recharge
H_2S	hydrogen sulfide
HA	Herd Area
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HALS	Historic American Landscape Survey
HCP	Habitat conservation plan
HFCs	hydrofluorocarbons
HMA	Herd Management Area
HMBP	Hazardous Materials Business Plan
hp	horsepower
HPMP	Historic Properties Management Plan
HPTP	Historic Properties Treatment Plan
Hz	Hertz
IBC	International Building Code
ICAPCD	Imperial County Air Pollution Control District
ICC	Interagency Coordinating Committee
in/sec	inches per second
IPCC	International Panel on Climate Change
K	erosion factor
kg	kilogram
kg/hr/source	kilograms per hour per source
KGRA	Mono-Long Valley Known Geothermal Resource Area

KOPs	key observation points
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
lbs	pounds
lbs/hr	pounds per hour
lb/yr	pounds per year
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
LLC	Limited Liability Corporation
L_{max}	maximum sound level
LOS	level of service
LOU	Letter of Understanding
Low Threat WDRs	Statewide General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality
LRMP	Land and Resource Management Plan
LRWQCB	Lahontan Regional Water Quality Control Board
LVO	Long Valley Observatory
LVFPD	Long Valley Fire Protection District
LVHAC	Long Valley Hydrological Advisory Committee
m	meter
M	Magnitude
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
MCMD	Mammoth Community Water District
MCEHD	Mono County Health Department Environmental Health Division
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MIS	Forest Service Management Indicator Species
ml	milliliters
MLFPD	Mammoth Lakes Fire Protection District
mm	millimeters
MM	Modified Mercalli
MND	Mitigated Negative Declaration
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	miles per hour
MP-I	Mammoth Pacific I (MP-I) Replacement Project
MP-II	Mammoth Pacific II – Geothermal Project
MPLP	Mammoth Pacific LP

MSDS	material safety data sheets
msl	mean sea level
MT	metric ton
$MTCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatts
MW	Moment Magnitude
MWh	megawatt-hour
N/A	Not Applicable
N2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NF	National Forest
NFIP	National Flood Insurance Program
NFSR	National Forest System Road
NHPA	National Historic Preservation Act
NO	nitric oxide
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NO_X	nitrogen oxides
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
NPPA	Native Plant Protection Act
NPS	United States National Park Service
NRCS	Natural Resources Conservation Service
NRHP or National Register	National Register of Historic Places
NSPS	New Source Performance Standard
NSR	New Source Review
NTP	Notice to Proceed
NWIS	National Water Information System
NWP	Nationwide Permits
O&M	operations and maintenance
O_2	oxygen
O_3	ozone
OBL	obligate
OEC	Ormat Energy Converter
OEHHA	Office of Environmental Health Hazard Assessment

OES	Office of Emergency Services
OHV	off-highway vehicle
ORNI 50	Ormat Nevada (project applicant)
OS	Open Space
OSHA	United States Occupational Safety and Health Administration
PA	Programmatic Agreement
PACs	protected activity centers
PAOT	Population at One Time
Pb	Lead
PDM	Project design measures
PERP	Portable Engine Registration Program
PFCs	perfluorocarbons
PGA	peak ground acceleration
PLC	Programmable Logic Controller
PLES-I	Mammoth Pacific PLES-I Geothermal Project
p.m.	post meridiem
PM	particulate matter
PM10	particulate matter less than 10 microns in diameter
PM2.5	particulate matter less than 2.5 microns in diameter
POA	Plan of Action
POD	Plan of Development
ppm	parts per million
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry
PPV	peak particle velocity
PR	partial retention
PRC	Public Resources Code
PRPA	Paleontologic Resources Preservation Act
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
PYFC	Potential Fossil Yield Classification
R	Retention
RCA	Riparian Conservation Area
RCRA	Resource Conservation and Recovery Act
RM	Resource Management
RM-INF	Inyo National Forest Land & Resource Management Plan
RMP	Resource Management Plan
RMS	root mean square
ROD	Record of Decision

RPS	Renewables Portfolio Standard
RTP	Regional Transportation Plan
RV	recreational vehicle
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act of 1986
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SDC	Seismic Design Category
SDWA	Safe Drinking Water Act
SE	State listed as endangered
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SIC	Scientist-in-Charge
SIP	State Implementation Plan
SMARA	Surface Mining and Reclamation Act of 1975
SNFPA	Sierra Nevada Forest Plan Amendment
SO_2	sulfur dioxide
SO_4	sulfate
SO_X	sulfur oxides
SPCC	Spill Prevention Control and Countermeasures
SR	Listed as Rare by the State of California
SSC	California Species of Special Concern
SSI	Forest Service of Special Interest
ST	State listed as threatened
SVP	Society of Vertebrate Paleontology
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
TDS	Total Dissolved Solids
TEPS	Threatened, endangered, proposed, and sensitive
THC	total hydrocarbons
TMDLs	Total Maximum Daily Loads
TPS	Temperature, pressure, and spinner
TQ	Threshold Quantity
µg/L	micrograms per Liter
$µg/m^3$	micrograms per cubic meter
UCMP	University of California Museum of Paleontology
UGB	urban growth boundary

UK	United Kingdom
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDOD	United States Department of Defense
USDOT	Unite States Department of Transportation
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
V	volts
VdB	velocity decibel
VMT	vehicle-miles-traveled
VOC	volatile organic compound
VQO	Visual Quality Objective
VRU	Motive fluid vapor recovery system
WRCC	Western Regional Climate Center

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CHAPTER 9
Glossary

A

A-weighted decibel scale (dBA): The frequency weighting measure that simulates human perception that is cited in most noise criteria to describe environmental noise and to assess impacts on areas sensitive to community noise. 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.

Adjacent: Defined by ASTM E1527-00 as any real property the border of which is contiguous or partially contiguous with that of the site or would be contiguous or partially contiguous with that of the site but for a street, road, or other public thoroughfare separating them.

Air Basin: A regional area defined for state air quality management purposes based on considerations that include topographic features that influence meteorology and pollutant transport patterns, and political jurisdiction boundaries that influence the design and implementation of air quality management programs.

Ambient Air Quality Standards (AAQS): A combination of air pollutant concentrations, exposure durations, and exposure frequencies that are established as thresholds above which adverse impacts to public health and welfare may be expected. Ambient air quality standards are set on a national level by the U.S. Environmental Protection Agency. Ambient air quality standards are set on a state level by public health or environmental protection agencies as authorized by state law.

Ambient Air: Outdoor air in locations accessible to the general public.

Anthropogenic: Resulting from human activity.

Archaeological district: A significant concentration, linkage, or continuity of sites, buildings, or features important in history or prehistory. There can be discontiguous districts composed of resources that are not in close proximity to one another.

Area of Critical Environmental Concern (ACEC): A designated area on public lands where special management attention is required: (1) to protect and prevent irreparable damage to fish and wildlife; (2) to protect important historic, cultural, or scenic values, or other natural systems or processes; or (3) to protect life and safety from natural hazards.

Attainment Area: An area that has air quality as good as or better than a national or state ambient air quality standard. A single geographic area may be an attainment area for one pollutant and a non-attainment area for others.

B

Basic Elements: The four design elements (form, line, color, and texture), which determine how the character of a landscape is perceived.

Blowout Prevention Equipment (BOPE): Equipment installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and the drill pipe or in open hole (for example, hole with no drill pipe) during drilling or completion operations.

C

Cancer: A class of diseases characterized by uncontrolled growth of somatic cells. Cancers are typically caused by one of three mechanisms: chemically induced mutations or other changes to cellular DNA; radiation induced damage to cellular chromosomes; or viral infections that introduce new DNA into cells.

Carbon Monoxide (CO): A colorless, odorless gas that is toxic because it reduces the oxygen-carrying capacity of the blood.

Characteristic: A distinguishing trait, feature, or quality.

Characteristic Landscape: The established landscape within an area being viewed. This does not necessarily mean a naturalistic character. It could refer to an agricultural setting, an urban landscape, a primarily natural environment, or a combination of these types.

Climate: A statistical description of daily, seasonal, or annual weather conditions based on recent or long-term weather data. Climate descriptions typically emphasize average, maximum, and minimum conditions for temperature, precipitation, humidity, wind, cloud cover, and sunlight intensity patterns; statistics on the frequency and intensity of tornado, hurricane, or other severe storm events may also be included.

Community Noise Equivalent Level (CNEL): A 24-hour average noise level rating with a 5 dB penalty factor applied to evening noise levels and a 10 dB penalty factor applied to nighttime noise levels. The CNEL value is very similar to the Day-Night Average Sound Level (Ldn) value, but includes an additional weighting factor for noise during evening hours.

Contrast: Opposition or unlikeness of different forms, lines, colors, or textures in a landscape.

Contrast Rating: A method of analyzing the potential visual impacts of proposed management activities.

Corrosive Soils: Potential soil-induced electrochemical or chemical action that could corrode or deteriorate concrete, reinforcing steel in concrete structures, and bare-metal structures.

Cretaceous: In geologic history the third and final period of the Mesozoic era, from 144 million to 65 million years ago, during which extensive marine chalk beds formed.

Criteria Pollutant: An air pollutant for which there is a national ambient air quality standard (carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, inhalable particulate matter, fine particulate matter, or airborne lead particles).

Critical Habitat: Habitat designated by the U.S. Fish and Wildlife Service under §4 of the Endangered Species Act and under the following criteria: 1) specific areas within the geographical area occupied by the species at the time it is listed, on which are found those physical or biological features essential to the conservation of the species and that may require special management of protection; or 2) specific areas outside the geographical area by the species at the time it is listed but that are considered essential to the conservation of the species.

Cultural Landscape: A geographic area, including both natural and cultural resources, associated with a historic event, activity, group, or person; or, a geographic area that has been assigned cultural or social meaning by associated cultural groups.

Cultural Modification: Any man-caused change in the land form, water form, vegetation, or the addition of a structure which creates a visual contrast in the basic elements (form, line, color, texture) of the naturalistic character of a landscape.

Cultural Resource: A location of human activity, occupation, or use identifiable through field inventory, historical documentation, or oral evidence. Cultural resources include archaeological and historical sites, structures, buildings, objects, artifacts, works of art, architecture, and natural features that were important in past human events. They may consist of physical remains or areas where significant human events occurred, even though evidence of the events no longer remains. And they may include definite locations of traditional, cultural, or religious importance to specified social or cultural groups.

Cultural Resource Data: Cultural resource information embodied in material remains such as artifacts, features, organic materials, and other remnants of past activities. An important aspect of data is context, a concept that refers to the relationships among these types of materials and the situations in which they are found.

Cultural Resource Data Recovery: The professional application of scientific techniques of controlled observation, collection, excavation, and/or removal of physical remains, including analysis, interpretation, explanation, and preservation of recovered remains and associated records in an appropriate curatorial facility used as a means of protection. Data recovery may sometimes employ professional collection of such data as oral histories, genealogies, folklore, and related information to portray the social significance of the affected resources. Such data recovery is sometimes used as a measure to mitigate the adverse impacts of a ground-disturbing project or activity.

Cultural Resource Integrity: The condition of a cultural property, its capacity to yield scientific data, and its ability to convey its historical significance. Integrity may reflect the authenticity of a property’s historic identity, evidenced by the survival or physical characteristics that existed during its historic or prehistoric period, or its expression of the aesthetic or historic sense of a particular period of time.

Cultural Resource Inventory (Survey): A descriptive listing and documentation, including photographs and maps of cultural resources. Included in an inventory are the processes of locating, identifying, and recording sites, structures, buildings, objects, and districts through library and archival research, information from persons knowledgeable about cultural resources, and on-the-ground surveys of varying intensity.

Class I: A professionally prepared study that compiles, analyzes, and synthesizes all available data on an area's cultural resources. Information sources for this study include published and unpublished documents, BLM inventory records, institutional site files, and state and National Register files. Class I inventories may have prehistoric, historic, and ethnological and sociological elements. These inventories are periodically updated to include new data from other studies and Class II and III inventories.

Class II: A professionally conducted, statistically based sample survey designed to describe the probable density, diversity, and distribution of cultural properties in a large area. This survey is achieved by projecting the results of an intensive survey carried out over limited parts of the target area. Within individual sample units, survey aims, methods, and intensities are the same as those applied in Class III inventories. To improve statistical reliability, Class II inventories may be conducted in several phases with different sample designs.

Class III: A professionally conducted intensive survey of an entire target area aimed at locating and recording all visible cultural properties. In a Class III survey, trained observers commonly conduct systematic inspections by walking a series of close interval parallel transects until they have thoroughly examined an area.

Cultural Resource Values: The irreplaceable qualities that are embodied in cultural resources, such as scientific information about prehistory and history, cultural significance to Native Americans and other groups, and the potential to enhance public education and enjoyment of the Nation's rich cultural heritage.

Cultural Site: A physical location of past human activities or events, more commonly referred to as an archaeological site or a historic property. Such sites vary greatly in size and range from the location of a single cultural resource object to a cluster of cultural resource structures with associated objects and features.

D

Day/Night Average Sound Level (Ldn): A 24-hour average noise level rating with a 10 dB penalty factor applied to nighttime noise levels. The Ldn value is very similar to the CNEL value, but does not include any weighting factor for noise during evening hours.

Decibel (dB): A generic term for measurement units based on the logarithm of the ratio between a measured value and a reference value. Decibel scales are most commonly associated with acoustics (using air pressure fluctuation data); but decibel scales sometimes are used for ground-borne vibrations or various electronic signal measurements.

Distance Zones: A subdivision of the landscape as viewed from an observer position. The subdivision (zones) includes foreground-middleground, background, and seldom seen.

E

Earthquake Fault Zones (EFZ): Zones regulated by the California Geological Survey around the surface traces of active faults where mapping demonstrates surface fault rupture has occurred within the past 11,000 years (Holocene time).

Enhancement: A management action designed to improve visual quality.

Equivalent Average Sound Pressure Level (Leq): The decibel level of a constant noise source that would have the same total acoustical energy over the same time interval as the actual time-varying noise condition being measured or estimated. Leq values must be associated with an explicit or implicit averaging time in order to have practical meaning.

Erosion: A natural process whereby soil and highly weathered rock materials are worn away and transported to another area, most commonly by wind or water.

Ethnographic Resources: Resources representing the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, Latino, or Asian immigrants. They may include traditional resource-collecting areas, ceremonial sites, value-imbued landscape features, cemeteries, shrines, or ethnic neighborhoods and structures.

Excavation: The scientific examination of an archaeological site through layer-by-layer removal and study of the contents within prescribed surface units, e.g. square meters.

Expansive Soils: A soil which significantly changes its volume in horizontal and vertical planes with changes in moisture content.

F

Fault (active): A fault that has had surface displacement during Holocene time (last 11,000 years).

Fault (potentially active): A Quaternary-age (last 2.6 million years) fault that lacks evidence of Holocene-age displacement.

Form: The mass or shape of an object or objects which appear unified, such as a vegetative opening in a forest, a cliff formation, or a water tank.

G

Gas-insulated switchgear (GIS): Equipment in an electrical power system (including disconnect switches, fuses, or circuit breakers) used to control, protect and isolate electrical equipment that uses pressurized SF_6 gas as an insulator.

Geomorphic Province: Naturally defined geologic regions that display a distinct landscape or landform.

Geothermal energy: The natural heat of the earth that, if conveyed by water and depending on temperature, can be used in a range of applications for power generation.

Geothermal fluid: Gas, vapor and water found within a geothermal reservoir.

Geothermal reservoir: An underground system of fractured and permeable rocks and the hot water or steam trapped in that volume of rock.

Geothermal Resource: A hydrothermal system which is (or may be) capable of supporting geothermal energy development. 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.

Geothermal System: See Geothermal Resource.

Graben structures: A depressed block of land bordered by parallel faults.

Greenhouse Gas (GHG): A gaseous compound that absorbs infrared radiation and re-radiates a portion of hat back toward the earth's surface, thus trapping heat and warming the earth's atmosphere.

H

Habitat: A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Hazardous Air Pollutant (HAP): Air pollutants which have been specifically designated by relevant federal or state authorities as being hazardous to human health. Most HAP compounds are designated due to concerns related to: carcinogenic, mutagenic, or teratogenic properties; severe acute toxic effects; or ionizing radiation released during radioactive decay processes.

Hertz (Hz): A standard unit for describing acoustical frequencies measured as the number of air pressure fluctuation cycles per second. For most people, the audible range of acoustical frequencies is from 20 Hz to 20,000 Hz.

Historical Site: A location that was used or occupied after the arrival of Europeans in North America (ca. A.D. 1492). Such sites may consist of physical remains at archaeological sites or areas where significant human events occurred, even though evidence of the events no longer remains. They may have been used by people of either European or Native American descent.

Holocene: Of, denoting, or formed in the second and most recent epoch of the Quaternary period, which began 11,000 years ago at the end of the Pleistocene.

Hydrocarbons: Any organic compound containing only carbon and hydrogen, such as the alkanes, alkenes, alkynes, terpenes, and arenes.

Hydrocompaction: Generally is limited to young soils that were deposited rapidly in a saturated state, most commonly by a flash flood. The soils dry quickly, leaving an unconsolidated, low density deposit with a high percentage of voids.

Horst structures: A raised fault block bounded by normal faults or graben.

Hydrologic Resource: A useful or potentially useful source of water in the form of a liquid, solid, or gas on the Earth's surface, in the soil and underlying rocks, and in the atmosphere.

I

Igneous: Rock, such as granite and basalt that has solidified from a molten or partially molten state.

Indian Tribe: Any American Indian group in the United States that the Secretary of the Interior recognizes as possessing tribal status (listed periodically in the Federal Register).

Indigenous: Being of native origin (such as indigenous peoples or indigenous cultural features).

Interdisciplinary Team: A group of individuals with different training, representing the physical sciences, social sciences, and environmental design arts, assembled to solve a problem or perform a task. The members of the team proceed to a solution with frequent interaction so that each discipline may provide insights to any stage of the problem and disciplines may combine to provide new solutions.

Invasive Species: An exotic species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13122, 2/3/99).

Isolate: Non-linear, isolated archaeological features without associated artifacts.

K

Key Observation Point (KOP): One or a series of points on a travel route or at a use area or a potential use area, where the view of a management activity would be most revealing.

Killing the well: The operation of placing a column of heavy fluid into a well bore in order to prevent the flow of reservoir fluids without the need for pressure control equipment at the surface. It works on the principle that the weight of the “kill fluid” or “kill mud” will be enough to suppress the pressure of the formation fluids.

L

Landscape Character: The arrangement of a particular landscape as formed by the variety and intensity of the landscape features and the four basic elements of form, line, color, and texture. These factors give the area a distinctive quality which distinguishes it from its immediate surroundings.

Landscape Features: The land and water form, vegetation, and structures which compose the characteristic landscape.

Landslide: A slope failure that involves downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces.

Lead Agency: The public agency that has the primary responsibility for approving a project that may have a significant impact upon the environment.

Leasable Minerals: Minerals whose extraction from federally managed land requires a lease and the payment of royalties. Leasable minerals include coal, oil and gas, oil shale and tar sands, potash, phosphate, sodium, and geothermal steam.

Line: The path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture. Within landscapes, lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches.

Liquefaction: A condition in which a saturated cohesionless soil may lose shear strength because of a sudden increase in pore water pressure caused by an earthquake.

Locatable Minerals: Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872, as amended. This includes deposits of gold, silver, and other uncommon minerals not subject to lease or sale.

Long Valley Caldera: A large-scale topographic depression 10 miles wide by 20 miles long created by a volcanic eruption ejecting 145 cubic miles of rock, and spreading a thick layer of ash over much of the Western United States (the layer is referred to as the "Bishop Tuff").

M

Maintenance Area: An area that currently meets federal ambient air quality standards but which was previously designated as a nonattainment area. Federal agency actions occurring in a maintenance area are still subject to Clean Air Act conformity review requirements.

Management Activity: A surface disturbing activity undertaken on the landscape for the purpose of harvesting, traversing, transporting, protecting, changing, replenishing, or otherwise using resources.

Memorandum of Understanding (MOU): A written but noncontractual agreement between two or more agencies or other parties to take a certain course of action.

Mineral Material Disposal: The sale of sand, gravel, decorative rock, or other materials defined in 43 CFR 3600.

Mining Claim: A mining claim is a selected parcel of Federal Land, valuable for a specific mineral deposit or deposits, for which a right of possession has been asserted under the General Mining Law. This right is restricted to the development and extraction of a mineral deposit. The rights granted by a mining claim protect against a challenge by the United States and other claimants only after the discovery of a valuable mineral deposit. The two types of mining claims are lode and placer. In addition, mill sites and tunnel sites may be located to provide support facilities for lode and placer mining.

Mitigation: Mitigation includes: (a) Avoiding the impacts altogether by not taking an action or parts of an action, (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation, (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment, (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, (e) Compensating for the impact by replacing or providing substitute resources or environments (40 CFR §1508.20).

Motive fluid vapor recovery system (VRU): Recovers vapors of the motive fluid which have formed and converts the recovered vapor into a usable product.

N

Nameplate Generation Capacity: The maximum rated output of a generator or other electric power production equipment under specific conditions designated by the manufacturer.

National Forest System: Includes all National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under title III of the Bankhead-Jones Farm Tennant Act (50 Stat. 525, 7 U.S.C. 1010–1012), and other lands, waters or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

National Forest System Road: 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.

National Pollutant Discharge Elimination System (NPDES): The NPDES permit program has been delegated in California to the State Water Resources Control Board. These sections of the CWA require that an applicant for a federal license or permit that allows activities resulting in a discharge to waters of the United States must obtain a state certification that the discharge complies with other provisions of the Clean Water Act.

National Register District: A group of significant archaeological, historical, or architectural sites, within a defined geographic area, that is listed on the National Register of Historic Places. See National Register of Historic Places.

National Register of Historic Places: The official list, established by the National Historic Preservation Act, of the Nation’s cultural resources worthy of preservation. The National Register lists archeological, historic, and architectural properties (i.e. districts, sites, buildings, structures, and objects) nominated for their local, state, or national significance by state and federal agencies and approved by the National Register Staff. The National Park Service maintains the National Register.

National Scenic Trail: One of the three categories of national trails defined in the National Trails System Act of 1968 that can only be established by act of Congress and are administered by federal agencies, although part or all of their land base may be owned and managed by others. National Scenic Trails are existing regional and local trails recognized by either the Secretary of Agriculture or the Secretary of the Interior upon application.

Native American: Indigenous peoples of the western hemisphere.

Nitric Oxide (NO): A colorless toxic gas formed primarily by combustion processes that oxidize atmospheric nitrogen gas or nitrogen compounds found in the fuel. A precursor of ozone, nitrogen dioxide, numerous types of photochemically generated nitrate particles (including PAN), and atmospheric nitrous and nitric acids. Most nitric oxide formed by combustion processes is converted into nitrogen dioxide by subsequent oxidation in the atmosphere over a period that may range from several hours to a few days.

Nitrogen Dioxide (NO2): A toxic reddish gas formed by oxidation of nitric oxide. Nitrogen dioxide is a strong respiratory and eye irritant. Most nitric oxide formed by combustion processes is converted into nitrogen dioxide by subsequent oxidation in the atmosphere. Nitrogen dioxide is a criteria pollutant in its own right, and is a precursor of ozone, numerous types of photochemically generated nitrate particles (including PAN), and atmospheric nitrous and nitric acids.

Nitrogen Oxides (NOx): A group term meaning the combination of nitric oxide and nitrogen dioxide; other trace oxides of nitrogen may also be included in instrument-based NOx measurements. A precursor of ozone, photochemically generated nitrate particles (including PAN), and atmospheric nitrous and nitric acids.

Non-native Species: See Invasive Species and Noxious Weed.

Noxious Weed: According to the Federal Noxious Weed Act (PL 93-629), a weed that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agricultural and commerce of the United States and to the public health.

Nonattainment Area: An area that does not meet a federal or state ambient air quality standard. Federal agency actions occurring in a federal nonattainment area are subject to Clean Air Act conformity review requirements.

n-pentane: A colorless, odorless organic compound with the formula C_5H_{12}, with a low boiling point that is used as a working medium in geothermal power plants.

O

Off-Highway Vehicle (OHV): Any vehicle capable of or designed for travel on or immediately over land, water, or other natural terrain, deriving motive power from any source other than muscle. OHVs exclude: 1) any non-amphibious registered motorboat; 2), any fire, emergency, or law enforcement vehicle while being used for official or emergency purposes; 3) any vehicle whose use is expressly authorized by a permit, lease, license, agreement, or contract issued by an authorized officer or otherwise approved; 4) vehicles in official use; and 5) any combat or combat support vehicle when used in times of national defense emergencies.

Organic Compounds: Compounds of carbon containing hydrogen and possibly other elements (such as oxygen, sulfur, or nitrogen). Major subgroups of organic compounds include hydrocarbons, alcohols, aldehydes, carboxylic acids, esters, ethers, and ketones. Organic compounds do not include crystalline or amorphous forms of elemental carbon (graphite, diamond, carbon black, etc.), the simple oxides of carbon (carbon monoxide and carbon dioxide), metallic carbides, or metallic carbonates.

Ormat Energy Converter (OEC) binary generating units: An electrical generation unit that converts heat into electrical energy. OECs are self-contained, fully automatic and produce grid compatible power. The OEC is based on the Rankine Power Cycle but uses organic working fluid which has the advantage of being more efficient than steam when operating on low-to-moderate temperature heat sources. Under production conditions, the working fluid is vaporized by the heat of the stream flowing through the vaporizer and pre-heater. The vapor expands as it passes through the organic vapor turbine, which is coupled to the generator. The exhaust vapor is subsequently condensed and is recycled to the vaporizer by the motive fluid cycle pump.

Overdraft condition: A condition in which the total volume of water being extracted from the groundwater basin would be greater than the total recharge provided to the basin.

Overstory: Larger, taller trees that occupy a forest and shade young trees, brush and other plants that grow beneath the larger trees.

Ozone (O3): A compound consisting of three oxygen atoms. Ozone is a major constituent of photochemical smog that is formed primarily through chemical reactions in the atmosphere involving reactive organic compounds, nitrogen oxides, and ultraviolet light. Ozone is a toxic chemical that damages various types of plant and animal tissues and which causes chemical oxidation damage to various materials. Ozone is a respiratory irritant, and appears to increase susceptibility to respiratory infections. A natural layer of ozone in the upper atmosphere absorbs high energy ultraviolet radiation, reducing the intensity and spectrum of ultraviolet light that reaches the earth's surface.

P

Paleontological Resources (Fossils): The physical remains of plants and animals preserved in soils and sedimentary rock formations. Paleontological resources are for understanding past environments, environmental change, and the evolution of life.

Paleontology: A science dealing with the life forms of past geological periods as known from fossil remains.

Paleozoic Era: An era of geologic time (542 million to 251 million years ago) between the Late Precambrian and the Mesozoic eras and comprising the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian periods.

Particulate Matter: Solid or liquid material having size, shape, and density characteristics that allow the material to remain suspended in the atmosphere for more than a few minutes. Particulate matter can be characterized by chemical characteristics, physical form, or aerodynamic properties. Categories based on aerodynamic properties are commonly described as being size categories, although physical size is not used to define the categories. Many components of suspended particulate matter are respiratory irritants. Some components (such as crystalline or fibrous minerals) are primarily physical irritants. Other components are chemical irritants (such as sulfates, nitrates, and various organic chemicals). Suspended particulate matter also can contain compounds (such as heavy metals and various organic compounds) that are systemic toxins or necrotic agents. Suspended particulate matter or compounds adsorbed on the surface of particles can also be carcinogenic or mutagenic chemicals. See PM10 and PM2.5.

Peak Ground Acceleration (PGA): A common measure of ground motion during an earthquake. 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. Unlike measures of magnitude, which provide a single measure of earthquake 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).

Peak Particle Velocity: A measure of ground-borne vibrations. Physical movement distances are typically measured in thousandths of an inch, and occur over a tiny fraction of a second. But the normal convention for presenting that data is to convert it into units of inches per second.

Permeability: The rate of flow of a liquid or gas through a porous material.

Petroglyph: Pictures, symbols, or other art work pecked, carved, or incised on natural rock surfaces.

pH (parts hydrogen): a measure of the acidity or basicity of a water-based solution. Pure water is considered neutral with a pH of 7, while solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline.

Physiographic Province: An extensive portion of the landscape normally encompassing many hundreds of square miles, which portrays similar qualities of soil, rock, slope, and vegetation of the same geomorphic origin (Fenneman 1946; Sahrhaftig 1975).

Pleistocene (Ice Age): An epoch in the Quarternary period of geologic history lasting from 2.6 million to 11,000 years ago. The Pleistocene was an epoch of multiple glaciation, during which continental glaciers covered nearly one fifth of the earth's land.

Pliocene: The Pliocene Epoch is the period in the geologic timescale that extends from 5.332 million to 2.588 million years before present.

PM10 (inhalable particulate matter): A fractional sampling of suspended particulate matter that approximates the extent to which suspended particles with aerodynamic equivalent diameters smaller than 50 microns penetrate to the lower respiratory tract (tracheo-bronchial airways and alveoli in the lungs). In a regulatory context, PM10 is any suspended particulate matter collected by a certified sampling device having a 50 percent collection efficiency for particles with aerodynamic equivalent diameters of 9.5 to 10.5 microns and an maximum aerodynamic diameter collection limit less than 50 microns. Collection efficiencies are greater than 50 percent for particles with aerodynamic diameters smaller than 10 microns and less than 50 percent for particles with aerodynamic diameters larger than 10 microns.

PM2.5 (fine particulate matter): A fractional sampling of suspended particulate matter that approximates the extent to which suspended particles with aerodynamic equivalent diameters smaller than 6 microns penetrate into the alveoli in the lungs. In a regulatory context, PM2.5 is any suspended particulate matter collected by a certified sampling device having a 50 percent collection efficiency for particles with aerodynamic equivalent diameters of 2.0 to 2.5 microns and an maximum aerodynamic diameter collection limit less than 6 microns. Collection efficiencies are greater than 50 percent for particles with aerodynamic diameters smaller than 2.5 microns and less than 50 percent for particles with aerodynamic diameters larger than 2.5 microns.

Precursor: A compound or category of pollutant that undergoes chemical reactions in the atmosphere to produce or catalyze the production of another type of air pollutant.

Prehistoric: Refers to the period wherein American Indian cultural activities took place before written records and not yet influenced by contact with nonnative culture(s).

Production well: A geothermal production well that produces fluid heated by the natural heat of the earth that is used to produce electricity.

Project area (Project Action area): The area in the immediate vicinity of all project components.

Project Design Measures: Measures or actions proposed by ORNI 50, LLC for their implementation to ensure the protection of the environment.

Protected Activity Center: A delineated area protecting important habitat for sensitive species.

Protocol Agreement (Protocol): A modified version of the NPA, adapted to the unique requirements of managing cultural resources on public lands in California, and is used as the primary management guidance for BLM offices in the state.

Q

Quaternary Age: The most recent of the three periods of the Cenozoic Era in the geologic time scale of the ICS. It follows the Tertiary Period, spanning 2.588 ± 0.005 million years ago to the present. The Quaternary includes two geologic epochs: the Pleistocene and the Holocene Epochs.

R

Rehabilitation: A management alternative and/or practice which restores landscapes to a desired scenic quality.

Riparian: Situated on or pertaining to the bank of a river, stream, or other body of water. Normally describes plants of all types that grow rooted in the water table or sub-irrigation zone of streams, ponds, and springs.

Road: A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Route: “Routes” represents a group or set of roads, trails, and primitive roads that represents less than 100 percent of the BLM transportation system. Generically, components of the transportation system are described as routes.

S

Saleable Minerals: Common variety minerals on the public lands, such as sand and gravel, which are used mainly for construction and are disposed by sales or special permits to local governments. See also Mineral Material Disposal.

Scale: The proportionate size relationship between an object and the surroundings in which the object is placed.

Scenery: The aggregate of features that give character to a landscape.

Scenic Area: An area whose landscape character exhibits a high degree of variety and harmony among the basic elements which results in a pleasant landscape to view.

Scenic Quality: The relative worth of a landscape from a visual perception point of view.

Scenic Quality Evaluation Key Factors: The seven factors (land form, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications) used to evaluate the scenic quality of a landscape.

Scenic Quality Ratings: The relative scenic quality (A, B, or C) assigned a landscape by applying the scenic quality evaluation key factors; scenic quality A being the highest rating, B a moderate rating, and C the lowest rating.

Scenic Values: See Scenic Quality and Scenic Quality Ratings.

Secretary of the Interior: The U.S. Department of the Interior is in charge of the nation's internal affairs. The Secretary serves on the President's cabinet and appoints citizens to the National Park Foundation board.

Sedimentary Rocks: Rocks, such as sandstone, limestone, and shale, that are formed from sediments or transported fragments deposited in water.

Sensitivity Levels: Measures (e.g., high, medium, and low) of public concern for scenic quality.

Settlement: A process by which soils decrease in volume. Earthquake induced settlement results when relatively unconsolidated granular materials experience vibration associated with seismic events. Local settlement can occur when areas containing compressible soils are subject to foundation or fill loads.

Special Status Species: Federal- or state-listed species, candidate or proposed species for listing, or species otherwise considered sensitive or threatened by state and federal agencies.

State Historic Preservation Office (SHPO): The official within and authorized by each state at the request of the Secretary of the Interior to act as liaison for the National Historic Preservation Act.

State Implementation Plan (SIP): Legally enforceable plans adopted by states and submitted to EPA for approval, which identify the actions and programs to be undertaken by the State and its subdivisions to achieve and maintain national ambient air quality standards in a time frame mandated by the Clean Air Act.

State Water Resources Control Board (SWRCB): Created in 1967, joint authority of water allocation and water quality protection enables the SWRCB to provide comprehensive protection for California's waters. The mission of the nine Regional Water Quality Control Boards is to develop and enforce water quality objectives and implementation plans that will best protect the State's waters, recognizing local differences in climate, topography, geology, and hydrology.

Stratigraphy: The order and relative position of strata (a layer of rock in the ground) and their relationship to the geological time scale.

Subsurface: Of or pertaining to rock or mineral deposits which generally are found below the ground surface.

Sulfur Dioxide (SO2): A pungent, colorless, and toxic oxide of sulfur formed primarily by the combustion of fossil fuels. It is a respiratory irritant, especially for asthmatics. A criteria pollutant in its own right, and a precursor of sulfate particles and atmospheric sulfuric acid.

T

Tertiary: The Tertiary Period marks the beginning of the Cenozoic Era. It began 65 million years ago and lasted more than 63 million years, until 2.6 million years ago. The Tertiary is made up of 5 epochs: the Paleocene Epoch, the Eocene Epoch, the Oligocene Epoch, the Miocene Epoch, and the Pliocene Epoch.

Texture: The visual manifestations of the interplay of light and shadow created by the variations in the surface of an object or landscape.

Toxic: Poisonous. Exerting an adverse physiological effect on the normal functioning of an organism's tissues or organs through chemical or biochemical mechanisms following physical contact or absorption.

Traditional Cultural Properties: Areas associated with the cultural practices or beliefs of a living community. These sites are rooted in the community's history and are important in maintaining cultural identity.

Trail: A linear route managed for human-powered, stock, or off-highway vehicle forms of transportation or for historical or heritage values. Trails are not generally managed for use by four-wheel drive or high-clearance vehicles.

U

Unauthorized Road. A road that is not a forest road or a temporary road and that is not included in a forest transportation atlas.

Understory: The area of a forest that grows below the mature trees. Plants in the understory consist of a mixture of seedlings and saplings of canopy trees together with understory grasses and shrubs.

V

Vandalism (Cultural Resource): Malicious damage or the unauthorized collecting, excavating, or defacing of cultural resources. §6 of the Archaeological Resources Protection Act states that "no person may excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands or Indian lands…unless such activity is pursuant to a permit issued under section 4 of this Act."

Variables: Factors influencing visual perception including distance, angle of observation, time, size or scale, season of the year, light, and atmospheric conditions.

Variety: The state or quality of being varied and having the absence of monotony or sameness.

Vehicle Miles Traveled (VMT): The cumulative amount of vehicle travel within a specified or implied geographical area over a given period of time.

Viewshed: The landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transportation corridor. Protection, rehabilitation, or enhancement is desirable and possible.

Visual Contrast: See Contrast.

Visual Quality: See Scenic Quality.

Visual Resources: The visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features).

Visual Resource Management Classes: Categories assigned to public lands based on scenic quality, sensitivity level, and distance zones. There are four classes. Each class has an objective which prescribes the amount of change allowed in the characteristic landscape.

Visual Resource Management (VRM): The inventory and planning actions taken to identify visual values and to establish objectives for managing those values; and the management actions taken to achieve the visual management objectives.

Visual Values: See Scenic Quality.

W

Wetlands: Permanently wet or intermittently water-covered areas, such as swamps, marshes, bogs, potholes, swales, and glades.

Wilderness Area: An area formally designated by Congress as part of the National Wilderness Preservation System as defined in the Wilderness Act of 1964 (78 Stat. 891), §2(c).

Wilderness Study Area: A roadless area or island that has been inventoried and found to have wilderness characteristics as described in §603 of FLPMA and §2(c) of the Wilderness Act of 1964 (78 Stat. 891). The source for both of these is BLM's IMP and Guidelines for Lands Under Wilderness Review (December 1979).

CHAPTER 10
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