DOE/EA-1849

ENVIRONMENTAL ASSESSMENT

Ormat Nevada
Northern Nevada Geothermal
Power Plant Projects

Department of Energy Loan Guarantee for ORMAT LLC's Tuscarora Geothermal Power Plant, Elko County, Nevada; Jersey Valley Geothermal Project, Pershing County, Nevada; and McGinness Hills Geothermal Project, Lander County, Nevada

U.S. Department of Energy
Loan Guarantee Program Office
Washington, D.C. 20585

August 2011

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS & ABBREVIATIONS

Acronym	Acronym Meaning
af/yr	Acre-Feet Per Year
AMSL	Above Mean Sea Level
ARPA	Archaeological Resources Protection Act of 1979
BAPC	Bureau of Air Pollution Control
BLM	Bureau of Land Management
BMP	Best Management Practice
CAPP	Chemical Accident Prevention Program
CESA	Cumulative Effects Study Area
dBA	Decibels
DOE	United States Department of Energy
EA	Environmental Assessment
EPAct	Energy Policy Act of 2005
EPM	Environmental Protection Measure
FONSI	Finding of No Significant Impact
gpm	Gallons Per Minute
GPS	Global Positioning System
HMA	Herd Management Area
kV	Kilovolt
Leq	Equivalent Sound Level
MHAD	McGinness Hills Archaeological District
mph	Miles Per Hour
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NNHP	Nevada Natural Heritage Program
NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
ORMAT	ORNI 42 LLC and ORNI 49 LLC Collectively
ORNI 42	ORNI 42, LLC, a subsidiary of Ormat Nevada
ORNI 49	ORNI 49, LLC, a subsidiary of Ormat Nevada
PMU	Population Management Unit
PSD	Prevention of Significant Deterioration
Recovery Act	American Recovery and Reinvestment Act of 2009
RMP	Resource Management Plan
ROD	Record of Decision
SR	State Route
TES	Threatened, Endangered, and Sensitive
UEPA	Utilities Environmental Protection Act
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

ORMAT NEVADA
ENVIRONMENTAL ASSESSMENT

1.0 INTRODUCTION

1.1 SUMMARY AND LOCATION OF PROPOSED ACTION

Ormat Nevada Inc. (ORMAT), through its subsidiaries, proposes to construct and operate three geothermal power production facilities and associated power transmission lines in northern Nevada. The power production facilities include the Tuscarora Geothermal Power Plant Facility (Tuscarora Facility) in Elko County, the Jersey Valley Geothermal Development Facility (Jersey Valley Facility) in Pershing County, and the McGinness Hills Geothermal Facility (McGinness Hills Facility) in Lander County (Figure 1). The Hot Sulphur Springs Transmission Line (Transmission Line) would connect the Tuscarora Facility to NV Energy's Humboldt Substation in Elko County. The Proposed Action to be addressed in this Environmental Assessment (EA) is issuance of a loan guarantee to John Hancock Financial Services for the ORMAT Nevada OFC 2 LLC Project by the United States Department of Energy (DOE) for development of these three geothermal power production facilities and related transmission capacity. In this EA, the term *Proposed Action* refers to issuance of the loan guarantee for the three geothermal power production facilities and the transmission line. When referring to individual facilities, the name of the specific facility is used.

The Proposed Action is expected to achieve 122 MW produced by the three geothermal power facilities, pursuant to a continuous construction plan for two phases of each facility. Total net output for the three facilities would be 63 net MW for Phase I and 59 MW for Phase II. Phase I is based on geologic resources that are currently known to be sufficient. Phase II would add capacity as more information is gained regarding additional geologic resources that are expected at each site.

The Tuscarora Facility would be located in northern Elko County in Independence Valley, approximately 70 miles north of Elko, Nevada. This facility would include production and injection wells and a 19 net megawatt generating binary power plant for Phase I and 19 net[1] megawatts for Phase II. The power plant and production/injection wells would be located wholly on private land leased from the Ellison Ranching Company. Construction began on the Tuscarora power plant facility in 2008 with the construction of access roads, well pads, and the drilling of geothermal production and injections wells, entirely on private land. Since that time, the private

[1] Net megawatts is the power transmitted onto the grid. Gross megawatts is the power produced by the plant. The difference is the energy used by the power plant.

applicant has continued work on the project, utilizing non-federal funds. As of the end of June 2011, construction of the facility was about forty percent complete. Construction of the project is expected to be complete around October 15, 2011. For purposes of evaluating the potential impacts of the proposed facility, DOE has analyzed the environmental effects of the entire facility, starting at the beginning of construction through the facility's proposed operation.

The Transmission Line is a 24.5-mile, 120 kilovolt (kV) electric power transmission line in Independence Valley, Elko County, Nevada. The proposed transmission line and related access road would be located on private lands and on public lands administered by the Bureau of Land Management (BLM) Tuscarora Field Office. The line would connect the Tuscarora Facility to NV Energy's Humboldt Substation located approximately seven miles west of the intersection of State Route (SR) 226 and SR 225. A Draft EA for the Transmission Line was issued in March 2008 (BLM, 2008a). No construction has taken place on the transmission line as of the end of July 2011.

The Jersey Valley Facility is located in Pershing County approximately 50 miles south of Winnemucca, Nevada. Phase I of the facility is a 14 net megawatt geothermal power generating plant with a 27.5-mile transmission line. Phase II is expected to add 10 net MW, for a total of 24 MW. Power generated at this facility would be sent to the NV Energy Bannock Switch located in Lander County, southwest of Battle Mountain, Nevada. The Jersey Valley Facility is located on both private lands and public land administered by the BLM Mount Lewis Field Office. Construction of the Jersey Valley facility and transmission line was completed in November 2010 and power production was initiated in December 2010. Environmental impacts of the facility and transmission line, from the beginning of construction through the facility's proposed operation, were analyzed in a BLM EA for which a FONSI was issued on June 4, 2010 (BLM, 2010). That EA is incorporated by reference in this EA (see below at 1.2.1).

The McGinness Hills Facility is located in Lander County approximately 10 miles northeast of Austin, Nevada. This facility will include a total of 60 net MW from two geothermal power generating plants, and a nine-mile transmission line. This includes 30 MW for Phase I and 30 MW for Phase II. The facility would deliver the power to NV Energy's Frontier Substation. This facility would be located on both private land and public lands administered by the BLM Mount Lewis Field Office, and the United States Forest Service (USFS), Austin/Tonopah Ranger District.

Under the McGinness Hills Geothermal Exploration Project, which was analyzed by BLM in an April 2009 EA (NV063-EA08-093 McGinness Hills Geothermal Exploration Project, Lander County, Nevada), eight wells have been drilled from 7 pads, associated access roads have been constructed on BLM land, and 5 additional wells and associated access roads have been

constructed on private land. No other construction has started on the facility or the transmission line. The environmental impacts of the facility and transmission line, from the beginning of construction through the facility's proposed operation, were analyzed in a 2011 BLM EA which is incorporated by reference in this EA (see below at 1.2.1).

1.2 APPROACH TO NEPA COMPLIANCE

1.2.1 Incorporation by Reference of Previous NEPA Documents

DOE's Proposed Action to issue a loan guarantee to John Hancock Financial Services for the ORMAT Nevada OFC 2 LLC Project was developed after the BLM completed National Environmental Policy Act (NEPA) EAs for the Transmission Line and Jersey Valley Facility, and after BLM initiated the NEPA EA for the McGinness Hills Facility. DOE is a cooperating agency on the McGinness Hills Facility EA, which was issued for public review on May 27, 2011.

NEPA allows agencies to incorporate material by reference if the effect will be to cut down on bulk without impeding agency or public review of the Proposed Action. The material must be reasonably available for inspection, and be cited and summarized in the NEPA document (40 CFR 1502.21). As the lead agency for this EA, the DOE reviewed the EAs for the Transmission Line, Jersey Valley Facility, and McGinness Hill Facility. Based on its review, DOE concluded that those EAs would contribute substantially to the analysis of the Proposed Action in this EA. Accordingly, the following documents are incorporated by reference in this EA:

- *Environmental Assessment – T G Power LLC Hot Sulphur Springs Transmission Line, 120 kV Electric Power Line, Northern Independence Valley, Elko County, Nevada.* Bureau of Land Management, Elko Field Office, March 2008 (BLM, 2008a).

- *Jersey Valley and Buffalo Valley Geothermal Development Projects, Pershing and Lander Counties, Nevada, Environmental Assessment*. Bureau of Land Management Battle Mountain District Office, May 2010 (BLM, 2010).

- *McGinness Hills Geothermal Development Project, Lander County, Nevada, Environmental Assessment*. Bureau of Land Management Battle Mountain District Office, May 2011 (BLM, 2011a).

1.2.2 New Analysis of the Proposed Tuscarora Facility

Not addressed in the EAs referenced above are the potential impacts specific to the Tuscarora Facility, specifically the power plant and ancillary structures. Therefore, this EA also addresses the environmental impacts specific to the proposed Tuscarora Facility. The proposed Tuscarora Facility is described in section 2.1. The affected environment and potential environmental consequences are addressed in section 3.1, and cumulative effects are assessed in section 4.1.

1.2.3 Supplemental Information and Analysis of the Transmission Line

An EA for the Hot Sulphur Springs Transmission Line was completed in March 2008 (BLM, 2008a). The proposed action was issuance of a Right-of-Way (ROW) grant by BLM for the Transmission Line. The official name on the ROW grant application was "TG Power Hot Sulphur Springs Transmission Line." BLM issued a FONSI and a Decision Record on March 21, 2008. However, a Right-of-Way Grant was never issued. Since then, ORMAT has re-filed the application, now titled "ORNI 42 and ORNI 49 Hot Sulphur Springs Transmission Line." In April 2011, the BLM determined that additional analysis would be required to supplement the information in the 2008 Transmission Line EA. BLM is a cooperating agency on this EA, which includes supplemental information and analysis that will enable it to make a determination on the pending Right-of-Way (ROW) application for the Transmission Line. The proposed Transmission Line is described in section 2.2; affected environment and potential environmental consequences are addressed in section 3.2, and cumulative effects are assessed in section 4.2.

1.3 PURPOSE AND NEED FOR ACTION

1.3.1 DOE Purpose and Need

Title XVII of the Energy Policy Act of 2005 (EPAct), P.L. 109-58 as amended by section 406 of the American Recovery and Reinvestment Act of 2009, P.L. 111-5 (Recovery Act), established a Federal loan guarantee program for eligible energy projects that employ innovative technologies. Title XVII authorizes the Secretary of Energy to make loan guarantees for various types of projects, including those that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." Section 406 of the Recovery Act added section 1705, which is designed to address the current economic conditions of the nation, in part, through eligible renewable and transmission projects to commence construction no later than September 30, 2011. The primary purposes of the Recovery Act are job preservation and creation, infrastructure investment, energy efficiency and science, assistance to the unemployed, and state and local fiscal stabilization. The purpose and need for the DOE action is to comply with its mandate by selecting eligible projects that meet the goals of the EPAct and the Recovery Act.

1.3.2 BLM Purpose and Need

In accordance with the Federal Land Policy and Management Act of 1976 and its implementing regulations, public lands are to be managed for multiple uses that take into account the long-term needs of future generations for renewable and non-renewable resources. The Secretary of the Interior is authorized to grant rights-of-way on public lands for systems of generation, transmission, and distribution of electric energy (Section 501(a)(4)). Taking into account the BLM's multiple use mandate, the purpose and need for the Proposed Action is to respond to ORMAT's Right-of-Way (ROW) applications for the geothermal power generation facilities

included under the Proposed Action. Under the terms of the Geothermal Steam Act, its revisions of 2007 and its implementing regulations (including 43 CFR Part 3200), and the Programmatic Geothermal Environmental Impact Statement for Geothermal Leasing in the Western United States and its Record of Decision of December 2008 (BLM 2008b), BLM must respond to the proposed plans, applications and programs submitted by the lessee or the lessee's designated operator.

The BLM's need for the Proposed Action is to respond to the Operations Plans, Utilization Plans, and FLPMA ROW applications submitted by ORMAT to construct and operate the Transmission Line, Jersey Valley Facility, and McGinness Hills Facility. This Proposed Action would, if approved, assist the BLM in addressing the management objectives in the Energy Policy Act of 2005 (Title II, Section 211), which establish a goal for the Secretary of the Interior to approve 10,000 MW of electricity from non-hydropower renewable energy projects located on public lands. This Proposed Action, if approved, would also further the purpose of Secretarial Order 3285A1 (DOI, 2010), which establishes the development of environmentally responsible renewable energy as a priority for the Department of the Interior.

1.4 RELATIONSHIP TO LAWS, REGULATIONS AND OTHER PLANS

1.4.1 Consistency with Statutes, Regulations, Policies and Procedures

This EA has been prepared in compliance with the following statutes and implementing regulations, policies and procedures:

- The National Environmental Policy Act of 1969, as amended (Public Law [PL] 91-190, 42 U.S.C. 4321 *et seq.*.
- U.S. Department of Energy National Environmental Policy Act Implementing Procedures (10 CFR Part 1021).
- BLM NEPA Handbook (H-1790-1).
- The Federal Land Policy and Management Act of 1976 (PL 94 579, 43 U.S.C. Section 1761 *et seq.*;
- 43 CFR Part 2800, Rights-of-Way, Principles and Procedures; Rights-of-Ways under the Federal Land Policy and Management Act and the Mineral Leasing Act; Final Rule, April 22, 2005.
- Guidelines contained in the BLM Elko Resource Management Plan (RMP).

The EA is also consistent with the EPAct (EPAct, 2005), which encourages the development of energy resources including geothermal resources on federally managed lands. Executive Order 13212 (EO, 2001), Actions to Expedite Energy-Related Projects, issued on May 18, 2001, states

"the increased production and transmission of energy in a safe and environmentally sound manner is essential."

The proposed projects are consistent with State of Nevada ordinances, policies and plans, and Secretarial Orders 3285 (DOI, 2009) and 3285A1 (DOE, 2010). In addition, Nevada law requires Nevada commercial power generators to produce 20 percent of power through renewable energy sources by 2015 (NRS, 2011). Therefore, there is a need to increase the level of exploration, development, and production of renewable energy sources including geothermal resources.

1.4.2 Programmatic EIS for Geothermal Leasing in the Western United States

The Record of Decision (ROD) for the *Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States* was signed on December 17, 2008. The ROD approved the BLM's decision to facilitate geothermal leasing on BLM lands in 12 western states, which includes Nevada. This decision, 1) allocates BLM lands as either open or closed for geothermal leasing, and identifies those National Forest System lands that are legally open or closed to leasing; 2) develops a reasonably foreseeable development scenario, and 3) adopts stipulations, Best Management Practices (BMP), and procedures for geothermal leasing and development. The ROD amended the Resource Management Plans (RMPs) for 114 land use plans, including the Elko and Battle Mountain districts, with BMPs and lease stipulations that could be applied to applications for exploration, drilling, utilization, and reclamation (BLM, 2008b).

1.4.3 Approvals, Permits and Regulatory Requirements

Specific approvals, permits, and regulatory requirements may be required for constructing and maintaining any of the proposed facilities. Table 1 lists federal, state, and local permits, policies, and actions that may be required as part of the Proposed Action.

Table 1 Potential Regulatory Responsibilities

CATEGORY	AGENCY	PERMIT NAME
Conditional Use Permit	Elko County	Conditional Use Permit
UEPA permit to construct	State of Nevada	UEPA Permit to Construct
CAPP	State of Nevada	NDEP Letter to Construct
UEPA permit to construct final	State of Nevada	UEPA Permit to Construct final
BAPC Permit to Operate	State of Nevada	BAPC Permit to Operate
Building Permit(s)	Responsible County	Building permit(s)
NDEP Injection control	State NDEP	Injection control program
NDOM Drilling permit	Nev. Div. of Minerals	Geothermal Drilling Permit
Stormwater permit	State NDEP	Construction stormwater permit

CATEGORY	AGENCY	PERMIT NAME
OPERATIONS		
CAPP Final	NDEP	Permit to operate
Building Permit Final	Elko County	Final inspection
FERC Qualifying Facilities	Fed. Energy Reg. Comm.	Small generator exemption
BAPC final inspection	State of Nevada	BAPC Permit to Operate
Fire Marshal	State of Nevada	HAZMAT permit
Boiler Pressure Vessel	Division of Industrial Relations	Boiler Pressure Vessel
NDEP Injection control final	NDEP	Injection control permit final
EASEMENTS & ROW		
Transmission Line ROW	BLM	Right of Way
Cultural Resources	BLM	Section 106 of the NHPA
Native American Concerns	BLM	P.L. 95-341, P.L. 101-601
Site access and pipe crossings	Elko County	Encroachment permit
Access Road	NDOT	Driveway Permit
Transmission line crossing	NDOT	Right of Way

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives, including the No Action Alternative. The Proposed Action is issuance by DOE of a loan guarantee to John Hancock Financial Services for the Ormat Nevada OFC 2 LLC Project for development of the Tuscarora Facility and Transmission Line, Jersey Valley Facility, and McGinness Hills Facility. Project features typical for these facilities include construction of production and injection wells, geothermal fluid[2] pipelines, power generating facilities and associated facilities, and transmission lines. These features are described for the Tuscarora Facility in section 2.1. Updated information and supplemental analysis for the Transmission Line is provided in section 2.2. Summaries of the Jersey Valley Facility EA, and McGinness Hills Facility EA are contained in Appendix B and Appendix C.

2.1 DESCRIPTION OF THE TUSCARORA FACILITY

Phase I of the Tuscarora Facility would consist of a 19 net megawatt electrical generating facility, production and injection wells, and ancillary facilities. The power plant would be located in Elko County, Nevada approximately 70 miles north of Elko, Nevada in Independence Valley (Figure 2). Access to the power plant from Elko, Nevada is via SR 225 to SR 226 and then northwest to the turn off to the Spanish Ranch. From the Spanish Ranch turnoff, the power plant is approximately three miles north of the Spanish Ranch building complex. ORMAT is proposing to construct a new road to the power plant from SR 226, which would bypass the Spanish Ranch building complex.

Approximately 62.8 acres would be disturbed for the Tuscarora Facility plant site, well pads, and pipeline construction. Table 2 summarizes the acres of land disturbance associated with the Tuscarora Facility.

If the geothermal resource at the Tuscarora Facility is found to be sufficient, the facility may be expanded in the future to include a second phase (Phase II) that may also be covered by the proposed DOE loan guarantee. Phase II if constructed will generate up to 19MW, similar to Phase I generating capacity. The size and configuration of Phase II facility, including the Generating Unit (OEC), Cooling Tower and Auxiliary Systems would be similar to Phase I. No modifications would have to be made to the Transmission Line to support additional capacity.

New wells, pipelines, and expanded production facilities would be required to develop additional resources in Phase II. The locations of the new wells for Phase II (geothermal wells and makeup wells) are still unknown and will be determined based on future exploration. Although it is

[2] Geothermal fluid, sometimes referred to as brine, is the hot fluid removed from the geothermal aquifer and used in the power plant through heat exchangers to vaporize the motive fluid.

impossible to determine the size of the future development, it is expected to be in similar size to the Phase I footprint. Deliveries of pentane after completion of Phase II may occur annually rather than biannually. Because the extent of the actual extent of the new geothermal development or location is not known at this time, provisions in the DOE Loan Guarantee agreement would require that Phase II obtain all required approvals and permits, including any required DOE NEPA review, prior to using loan guaranteed funds for construction.

Table 2 Summary of Surface Disturbance: Tuscarora Facility

Description	BLM (acres)	Private (acres)
Temporary Disturbance		
Pipeline Construction	-	16.5
Plant Site	-	-
Well Pads	-	-
Subtotal	**-**	**16.5**
Permanent Disturbance		
Pipeline Construction	-	7.0
Plant Site	-	20.0
Well Pads	-	19.3
Subtotal	**-**	**46.3**
TOTAL	**-**	**62.8**

2.1.1 Generating Facilities

The operation of the proposed Tuscarora Facility is based on the Rankin cycle, in which an organic fluid (motive fluid) absorbs heat from a heat source (geothermal brine), causing the motive fluid[3] to vaporize. In this facility, geothermal fluid would be pumped from the wells to the surface and conveyed through pipelines to the power plant. The geothermal fluid goes through a heat exchanger and then would be pumped back into the geothermal aquifer. The geothermal fluid is not exposed to the atmosphere or directly to equipment within the facility. The vaporized motive fluid from the heat exchanger expands in the turbine, producing rotational shaft power by transforming kinetic energy gained by the vapors' expansion process. Figure 3 provides a flow schematic diagram of the process.

[3] The organic motive fluid used in the thermal cycle is a hydrocarbon, typically Normal Pentane (pentane), and is selected for optimal utilization of the available heat source.

The geothermal brine flowing through the Level I vaporizer tubes enters the tube section of the Level II vaporizer and then in parallel to the Level I and Level II tube side of the preheaters while the motive fluid flows through the shell side of the vaporizers and the preheaters. The motive fluid closed cycles of the two levels are totally independent.

A multi-stage centrifugal pump forces the motive fluid from the condensers into the preheater's shell section. The fluid is preheated in the preheaters. In the vaporizer the motive fluid heats to boiling point and vaporizes. The motive fluid vapor passes through the vapor inlet assembly, then enters the organic turbine and expands, producing rotational shaft power and also dropping in pressure and temperature. The low-pressure motive fluid vapor flows to a water-cooled condenser, condenses and then is pumped back into the preheater. The motive fluid thermal cycle is a closed loop cycle.

The following sections provide a description of the equipment proposed for the generating facility. Figure 4 shows the location of the major components proposed for use at the facility.

Vaporizer/Preheater

The geothermal brine flowing through vaporizer/preheater tubes heats and vaporizes the motive fluid, which flows through the vaporizer/preheater shell sides. A total of two vaporizers and four preheaters are included for the plant.

Power Skid

The Tuscarora Facility power generating units include two power skids; each consisting of two turbines coupled to a synchronous generator, with two shaft ends. There are a total of four turbines and two generators included in the plant.

Condenser

The exhaust vapors flow from the turbines to a water-cooled condenser, where it is cooled and condensed back into organic liquid. Each organic turbine is connected to a separate condenser, thus there are a total of four water-cooled condensers included in the plant.

Cooling Water System and Cooling Tower

Cooling water flows through the tube side of the condenser, collecting heat from the condensing motive fluid. From the condenser the hot water flows to a cross flow cooling tower. Cooling water pumps pump the colder water from the cooling tower basin to the condenser. The cooling tower would be located on the east side of the facility pad and would be approximately 47 feet, 6 inches above grade. The cooling tower would not be visible from SR 226 or from the Spanish Ranch.

Feed Pumps

The cycle feed pumps are multistage centrifugal pumps, which transfer the motive fluid from each condenser to the preheaters in each level.

Power and Control Cabinets

The power and control boards house the Programmable Logic Controller, the 24-volt direct current distribution box with its fuses and circuit breakers, the Generator Management Protection Relay, the Backup Generator Protection Relay, the Motor Control Center, as well as transducers and control relays.

Substation and Transmission

The main transformer in the power plant substation steps-up the 13.2kV generator voltage output to the transmission line voltage of 120kV. The Transmission Line is a 24.5-mile transmission line that delivers the energy to NV Energy's Humboldt Substation. The Transmission Line is described in section 2.2.

2.1.2 Production Wells

The Tuscarora Facility would use three geothermal fluid production wells to supply the generating facility. All three wells were drilled between 2008 and 2010 and are located in Section 8, Township 41 North (T41N), Range 52 East (R52E), as shown on Figure 4. The three production wells are 65-8, 65A-8, and 65B-8. Each well is approximately 5,000 feet deep. The wells were constructed to meet the geothermal well standards of the Nevada Division of Minerals (NDOM), and other applicable regulatory standards.

The surface casing of each well is approximately 20 inches in diameter. Intermediate casings in the wells are $13^{5}/_{8}$ inches in diameter. During drilling, Blowout Protection Equipment was installed and tested in accordance with the NDOM well drilling permit.

2.1.3 Injection Wells

The Tuscarora Facility has four injection wells to re-inject geothermal fluids back into the aquifer. These wells include 66-5, 66A-5, 72-8, and 87A-5 and are located in Sections 5 and 8, T41N, R52E.

In addition to these injection wells, a fifth well (53-8) would be used to inject cooling tower blowdown water back into the geothermal reservoir (not the groundwater aquifer). Blowdown is a volume of water from the cooling tower that is replaced with fresh make-up water to maintain an acceptable level of total dissolved solids (TDS) in the cooling system. The design of the cooling tower allows for a maximum of 3.2 concentration cycles. Therefore, concentration of TDS in Blowdown water is three times higher than the fresh make-up water. Based on chemical

analysis of fresh water from makeup well MW-1, and chemical analysis of the geothermal water in Well 53-8, concentrated Blowdown quality is of a similar grade as the geothermal resource (600 mg/L).

The location of injection wells is shown in Figure 4. The construction and operation of these wells would meet applicable requirements of NDOM and the Bureau of Water Pollution Control as identified in the respective permits. These permits govern how the wells are constructed and operated. The Bureau of Water Pollution Control governs the injection of geothermal fluid, including water quality, back into the geothermal aquifer.

2.1.4 Fresh Water Production Wells

Two fresh water wells would be drilled to supply fresh water for the cooling tower. These two fresh water wells would be located in Sections 17 and/or 21, T41N, R52E, as shown in Figure 4. It is likely that only one well would be needed at a time to supply the necessary 1,200 gallons per minute (gpm). Two wells are planned so that if maintenance is required on one pump, the other would be available to supply the necessary water. Also, during periods of high temperature and low humidity, it may be necessary for both wells to be pumped for a short time to meet the demand for cooling water. Water demands would vary from season to season with peak demand of up to 1,500 gpm in the summer with an average use of 1,100 gpm in the winter.

2.1.5 Pipelines

Several pipelines would be constructed for conveying both geothermal fluid and fresh water from wells to the power plant site. The Tuscarora Facility includes three production wells to produce sufficient geothermal fluid for the proposed power production. All of the production wells (65-8, 65A-8, and 65B-8) are located adjacent to the power plant pad as shown in Figure 4. Approximately 680 feet of pipe would be needed to convey geothermal fluid from the wells to the power plant. The pipelines from the production wells to the power plant would have a diameter of 16 to 20 inches.

Following use of the geothermal fluid in the power plant, the fluid would be conveyed to four injection wells located to the north of the power plant site, as shown in Figure 4. Approximately 8,700 feet of pipe would be constructed from the power plant to the injection wells. These pipelines would have a diameter of up to 16 inches.

The last pipeline would bring fresh water to the power plant cooling tower. The fresh water wells are located approximately two miles south of the power plant site. To maintain the project on private land, the route of the fresh water line would follow the private land border. The entire length of this 11,100-foot pipeline is underground.

Geothermal pipelines would be constructed above ground on concrete supports as shown in Figure 5. Proposed pipelines would parallel existing roads, to the extent possible, thus no new roads would be required along these pipelines. In areas where the pipelines deviate from existing roads, a two-track road of approximately 0.2 miles may be required. The total disturbance associated with the pipelines would be 23.5 acres. The 16-inch HDPE fresh water pipeline would be installed at a depth of four to five feet underground.

2.1.6 Office and Ancillary Facilities

An office building or other small structure would be located on the south side and adjacent to the power plant facility. The office building would include a control room, electrical room for the power plant, other offices, and bathrooms. In addition, a machine shop building will be located on the east side of the plant.

2.1.7 Adopted Environmental Protection Measures

ORMAT has incorporated a number of Environmental Protection Measures (EPMs) into the Proposed Action to reduce environmental impacts, ensure protection of cultural and biological resources, and comply with regulatory protective and monitoring requirements of applicable permits and plan approvals. The proposed EPMs also reflect a review of the BMPs contained in the Record of Decision (ROD) for the *Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States*. The ROD amended the Resource Management Plans (RMPs) for both the Elko and Battle Mountain districts to include the BMPs as well as lease stipulations that could be applied to applications for geothermal exploration, drilling, utilization, and reclamation. The ROD was issued in December 2008 (BLM, 2008b). The following sections describe the EPMs incorporated in the Proposed Action, which ORMAT has committed to implement.

2.1.7.1 Air Quality

- Fugitive dust is specifically addressed as a condition in the Fugitive Dust Control Plan portion of the Nevada Division of Environmental Protection (NDEP) Surface Disturbance Permit Application. ORMAT will implement an ongoing program to control fugitive dust from disturbed areas using BMPs. It is anticipated that fugitive dust emissions would be controlled primarily on gravel roads with the use of water or chemical dust suppressants. Additional BMPs may be used if watering or chemical suppressants are not sufficient for controlling fugitive dust emissions.

- Emissions of non-condensable gas are not expected during normal plant operations. However, some of the binary working fluid would be released to the atmosphere from rotating seals and flanges and from the process of purging the buildup of air that has

leaked into the binary turbine condenser. These binary working fluid emissions will be regulated and monitored under a Class II (non-major) permit issued by the NDEP Bureau of Air Pollution Control (BAPC).

- A 25-mile per hour (mph) speed limit will be posted on the access roads leading to the site, with a 15-mph limit posted inside the power plant fenced area for safety reasons and to reduce dust emissions.

- Access roads and other traffic areas will be maintained on a regular basis to minimize dust and provide for safe travel conditions.

2.1.7.2 Cultural Resources

- ORMAT will avoid identified eligible and potentially eligible cultural resource sites that have been identified in surveys of the site and the transmission line route, whenever possible during design, construction, and operation of the project.

- For 15 sites where impacts cannot be avoided, an approved mitigation plan has been developed and will be implemented to meet the requirements of the State Historic Preservation Office and the BLM.

- A buffer of approximately 30 meters would be established during construction only, and flagging will be placed around all eligible and potentially eligible cultural resource sites to help provide protection to the sites. Project equipment and facilities will not encroach into the established 30-meter buffer zone.

- Erosion control methods will be employed to prevent run-off that could affect nearby cultural sites.

- ORMAT will limit vehicle and equipment travel to previously established roads and construction areas.

- Any unplanned discovery of cultural resources, items of cultural patrimony, sacred objects or funerary items would require that all activity in the vicinity of the find cease, and the appropriate contact at the State Historic Preservation Office be notified immediately by phone with written confirmation to follow. The location of the find will not be publicly disclosed. Any human remains must be secured and preserved in the place until the authorized officer issues a Notice to Proceed.

- ORMAT would enter into a programmatic agreement with the State Historic Preservation Office to curate, protect, and monitor cultural resources.

- All eligible and potentially eligible sites will be protected from entry during the construction of the power plant and associated facilities.

- Prior to construction, ORMAT will conduct mandatory training of workers regarding the potential to encounter historic or prehistoric sites and objects, the proper procedures in the event that cultural items are encountered, prohibitions on artifact collection, and prohibitions on disclosure of the location of culturally sensitive areas.

2.1.7.3 Biological Resources

- To avoid destruction of birds, nests, eggs, or young, ORMAT will avoid land clearing of native vegetation during the avian breeding season (April 1 to August 15). If it becomes necessary to clear any area during the breeding season, a qualified biologist would conduct a survey for active nests within areas to be cleared of vegetation. If active nests are located, a protective buffer zone will be established. The size of the buffer zone will be based on the species identified and be approved by the relevant agency. The buffer zone would remain in place until it is confirmed that the young have fledged.

- Trash and other waste products will be placed in containers with covers to prevent access by wildlife. The waste will be collected by a local sanitation company and properly disposed of at the City of Elko landfill.

- A 25-mph speed limit will be posted on the access roads leading to the site, with a 15-mph limit posted inside the power plant fenced area.

- Currently, employees and contractors are strictly prohibited from carrying firearms on the job site to discourage illegal hunting and harassment of wildlife. This policy will be continued as the facility becomes operational.

- In collaboration with the Nevada Department of Wildlife (NDOW), ORMAT will develop and implement a Noxious Weed Control Plan.

- In collaboration with NDOW, ORMAT will install two pipeline crossings to facilitate the migration of mule deer and other big game species through the project site.

- Vehicle traffic will be restricted to defined roads or overland travel routes to reduce potential mechanical transport of noxious weed seeds.

- When working in areas of established noxious weed or invasive species populations, such as hoary cress (*Cardaria draba*) and cheatgrass (*Bromus tectorum*), equipment will be washed prior to leaving the site to reduce spread of these weed species.

2.1.7.4 Threatened, Endangered, and Sensitive Species

Habitat for the greater sage grouse is present throughout the Tuscarora Facility area, and sage grouse are present near the power plant site. A total of 10 leks (breeding areas) are present in the vicinity of the Tuscarora Facility, and an estimated 13 additional sites are in the vicinity of the Transmission Line. The U.S. Fish and Wildlife Service (USFWS) has placed the greater sage grouse on the list of species that are candidates for Endangered Species Act protection. Evidence suggests that habitat fragmentation and destruction across much of the species' range has contributed to significant population declines over the past century. If current trends persist, many local populations may disappear in the next several decades, with the remaining fragmented population vulnerable to extinction. In response to these trends, the Greater Sage Grouse Conservation Measures Implementation Plan was prepared by ORMAT, BLM, NDOW and DOE. The Implementation Plan, presented in Appendix A, provides a number of measures to be included as part of the Tuscarora Facility and Transmission Line projects to protect sage grouse. Those measures are presented below.

<u>General Measures (See Appendix A for additional EPMs)</u>

- Flight diverters – Bird Mark medallion-style and Dulmison Swan coil-style diverters, spaced and colored per manufacturer's recommendations for 12 of 24 miles.

- Predatory Bird Perching and Nesting deterrents – Top of Wood Structures: "Wood Pole Cap – Large" combined with large (at least 10 inches exposed) galvanized nail through apex into wood. Steel Structures: Same pole cap or fabricated pole cap with steel rod at least 10 inches in length protruding from apex of cap. State-of-the-art deterrents on all other portions of structure hardware.

- Raven management via NDOW depredation permit.

- Low output, motion sensor lights to minimize light impacts (low-emissivity on-demand motion lights on project area).

- Non-refractive tinted window on buildings at facilities.

- Temporal restriction on construction and facilities testing (e.g. pipe pressure venting) between one hour before legal sundown and two hours after legal sunrise during the March 15 to May 15 lek period.

- Reclamation of construction disturbance on project area must be monitored until seeding efforts are deemed successful.

- Surface water monitoring plan to monitor adjacent public land seeps and springs important to the area wildlife (see Appendix A).

- Travel management.
  - Defer use to ranch access during the lek period March 15 to May 15 (pursuant to NV Energy Standards).
  - Schedule deliveries outside lek hours or season.
  - Schedule shift changes outside the period from one hour before legal sundown to two hours after legal sunrise during the March 15 to May 15 lek period.

Conservation Fund Measures

ORMAT will voluntarily fund, at a 6:1 ratio at $600 per acre, terrestrial habitat enhancements and rehabilitation to compensate for 84.5 acres of surface disturbance in sage-grouse habitat in the vicinity of the Tuscarora Facility (Figure 1). At a 6:1 ratio, this equates to 507 acres of habitat conservation, improvement or protection. The potential or likely treatment areas to be restored include BLM managed lands in vicinity of the project area. Treatment areas will be identified on a case-by-case basis based on field inventory of habitats, conditions, and potential value to sage grouse based on monitoring results. Implementation of measures would be a requirement of BLM's ROW grant for the facility. Examples of Conservation Fund measures are listed below. A complete description of the Conservation Fund program is included in section A.2 of Appendix A.

- Wildfire restoration including seedings, noxious and invasive plant treatment, and possible temporary fencing to protect areas of restoration.

- Brush thinning via mechanical, herbicide or hand thinning followed by seeding.

- Mechanical or hand shrub thinning, or green stripping to reduce fuels and fire risk to sage-grouse habitats.

- Weed treatment followed with successful seeding.

- Retrofit of existing power lines with flight diverters, or predatory bird anti-perching measures.

- Modify and mark BLM project fences or landowner fences to reduce the potential for sage-grouse collisions or minimize the potential for predatory bird perch sites.

- Temporary fencing to protect the restored habitat.

Sage Grouse Monitoring

- As described in Appendix A, ORMAT will monitor lek attendance at certain active and unknown status leks for ten years. The results of that monitoring may trigger specific environmental protection measures, including installation of 8,500 feet of underground transmission line and additional measures for noise reduction..

Sage Grouse Collaring

As described in Appendix A, Ormat will be responsible for a telemetry program to track both male and female sage-grouse for the purpose of determining sage-grouse activities in relation to the power plant and transmission line.

Noise Monitoring

As described in Appendix A, sound pressure level monitoring will take place and will be used to determine noise levels at leks and whether 1) noise levels above ambient can be attributed to Ormat operations and 2) whether environmental protection measures, such as additional noise reduction measures at the power plant, should be implemented.

2.1.7.5 Water Resources

Seeps, springs, and associated meadows on public lands surrounding the Tuscarora Facility are important sage-grouse brood rearing habitat. If the Tuscarora Facility's use of geothermal waters or other groundwater decreases the supporting flows and availability of sage-grouse habitat, the dependent sage-grouse would be impacted. To minimize this risk, ORMAT will undertake the following measures:

- Access across drainages, seeps, and springs will be avoided wherever possible. Culverts will be used if necessary to cross any large drainage.

- Silt fences and/or straw waddles will be used in areas requiring sediment control.

- Buffer zones will be established along water bodies to restrict access, thus minimizing potential impacts from erosion or other spills.

- ORMAT will develop a stormwater management plan pursuant to Nevada Administrative Code (NAC) 445A.236, Stormwater General Permit NVR10000. The stormwater General Permit will cover construction and maintenance of all culverts installed on the access road, use of BMPs at the disturbance sites along the transmission line, and BMPs for the plant pad and other disturbance in the plant area (well pads, pipelines, etc.).

- Ground water monitoring will be conducted for adjacent public land seeps and springs important to the area wildlife.

- Surface water monitoring of adjacent public land seeps, including Public Water Reserve (PWR) 05598, and springs important to the area wildlife is described in detail in Appendix A. Environmental measures that would be triggered by impacts to diminished flow are also described in Appendix A.

2.1.7.6 Hazardous Materials

ORMAT geothermal power facilities utilize pentane as the working fluid in the generation cycle. Due to the flammability of pentane and the quantity on-site, ORMAT is required to comply with several permitting requirements including the Nevada Chemical Accident Prevention Program (CAPP).

The requirements of these regulations generally include hazardous material identification, on-site and off-site hazard assessment and release consequences, accident prevention, emergency response, and public right-to-know. Of these regulatory requirements, the Nevada CAPP is the most comprehensive. The features and requirements of the CAPP are summarized below.

CAPP requirements fall into one of three categories: accident prevention, emergency response, or public right-to-know. Through the accident prevention program, facilities are required to: evaluate and mitigate hazards, understand the design parameters of their processes and operate within the appropriate design limits, prepare comprehensive operating procedures, thoroughly train operators in those procedures and maintain the facility equipment and instruments to prevent premature failure. Through the emergency response program, facilities are required to develop an action plan for dealing with potential emergency situations and they are further required to coordinate emergency response activities with local responders, to ensure that the responders are prepared to deal with the emergencies appropriately.

Prior to commencing a new CAPP process, ORMAT will obtain a Permit to Construct and a Permit to Operate. Under the permitting process, NDEP will verify that the accident prevention and emergency response preparedness elements are developed and implemented to ensure CAPP compliance upon facility startup.

During the Permit to Construct phase, NDEP will evaluate select design and construction issues, review the process hazard analysis, review the emergency response plan, and ensure that HAZMAT response capability is available. In order to receive a Permit to Construct, ORMAT must demonstrate that HAZMAT capability will be available 24 hours a day, and provided by either a local fire department or the facility.

During the Permit to Operate phase, NDEP will evaluate the remainder of the accident prevention program elements to ensure they are developed and implemented to the extent possible, prior to startup.

2.1.7.7 Public Health and Safety

All construction and operating equipment will be equipped with applicable exhaust spark arresters. Fire extinguishers will be available on-site. Water that is used for construction and dust control will be available for fire fighting. Personnel will be allowed to smoke only in designated areas, and they will be required to follow ORMAT policy and applicable BLM regulations regarding smoking. The following fire contingencies will be implemented:

- The BLM Elko District Office (775-753-0200) will be notified of any wildland fire, even if the available personnel can handle the situation or the fire poses no threat to the surrounding area. Additionally, the Elko Interagency Dispatch Center will be notified (775-748-4000).

- A list of emergency phone numbers will be available on-site.

- All vehicles shall carry at a shovel and a conventional fire extinguisher.

- Adequate fire-fighting equipment (diesel motorized fire pump and dedicated fire water system approved by the Elko County Fire Marshall, a shovel, a Pulaski, standard fire extinguisher(s), and an ample water supply) shall be kept readily available at a minimum of five locations at the facility.

- Vehicle catalytic converters (on vehicles that enter and leave the site on a regular basis) shall be inspected often and cleaned of all flammable debris.

- All cutting/welding torch use, electric-arc welding, and grinding operations shall be conducted in an area free, or mostly free, from vegetation. An ample water supply and shovel shall be on hand to extinguish any fires created from sparks. At least one person in addition to the cutter/welder/grinder shall be at the work site to promptly detect fires

created by sparks. In the power plant area, all hot work will require a special operator permit.

- Personnel will be responsible for being aware of and complying with the requirements of any fire restrictions or closures issued by the BLM, as publicized in the local media or posted in the field or on the Elko District website.

DOE believes that the Tuscarora Facility is an unlikely target for intentionally destructive acts (terrorism or sabotage) and would have an extremely low probability of being attacked. Protective fencing will be constructed around the perimeter of the site, within which all proposed activities will be confined. Public access to the site will be restricted to a gated main entrance, which will be continuously monitored. Nighttime security lighting will be used, which will also benefit the safety of the workers and public in the operation of the facility. The facility will be continuously operated and under worker surveillance 24 hours a day, 7 days a week. Access to all facility buildings will be controlled. All authorized personnel (employees and contractors) will be issued access keys to regulate entry into each facility building, including office and control areas. Storage and use of hazardous materials will comply with federal, state, and local regulatory requirements. With all of these measures in place, the potential for impacts from intentionally destructive acts is considered to be very low. Nevertheless, in the unlikely event that destructive acts were somehow to occur, the consequences would not exceed those set forth in the fire contingency plan presented above.

2.1.8 Project Decommissioning and Site Reclamation

The Tuscarora Facility will be constructed, operated, and maintained by ORMAT. Intermediate and final reclamation is required for geothermal power plants, geothermal wells, geothermal pipelines, and ancillary facilities located on private land, and BLM managed properties. All disturbed areas resulting from the project will be reclaimed in accordance with the requirements of 43 CFR 3200. Interim reclamation of the project to the extent practicable will occur throughout the project life. Final reclamation will involve removal of the facility and all associated equipment and will occur at the time of facility decommissioning.

2.1.8.1 Reclamation - Temporary Disturbance

a. Reclamation for temporary disturbances will be completed no later than 12 months from the time that the final well on the location has been completed, season and weather permitting.

b. Liquids from the reserve pits will either naturally evaporate or be removed as may be necessary (i.e. pumped into another well), or allowed to solidify in-situ prior to backfilling.

c. Reserve pits will be closed and backfilled within 12 months of release of the drill rig. All reserve pits remaining open after 12 months will require written authorization of the BLM Tuscarora Field Office Authorized Officer.

d. The solid contents remaining in each of the reserve pits, typically consisting of non-hazardous, non-toxic drilling mud and rock cuttings will be tested to confirm that they are not hazardous. If the test results indicate that these solids are non-hazardous, the solids will then be mixed with the excavated rock and soil and buried by backfilling the reserve pit.

e. Following completion activities, pit liners will be completely removed or removed down to the solids level and disposed of at an approved landfill, or treated to prevent their reemergence to the surface and interference with long-term successful revegetation.

f. A well with no commercial potential may continue to be monitored, but will eventually be plugged and abandoned in conformance with the well abandonment requirements of the BLM and the Nevada Division of Minerals (NDOM).

g. Portions of cleared well sites not needed for operational and safety purposes will be re-contoured to a final or intermediate contour that will blend with the surrounding topography as much as possible. Stockpiled topsoil will be spread on the area to aid in revegetation. Areas to be reclaimed will be ripped, tilled, or disked on contour, as necessary.

h. Revegetation will include site appropriate seed mixtures for various ecological site types encountered. Disturbed areas will be reseeded with a diverse mix of perennial native or introduced plant species.

i. Interim reclamation stormwater management actions will be taken to ensure disturbed areas are quickly stabilized to control surface water flow and to protect both the disturbed and adjacent areas from erosion and siltation.

j. When well drilling and completion has occurred, some portions of the well location will undergo interim reclamation. Interim reclamation may not take place where work-over rigs and fracturing tanks need a level area to set up in the future. Some areas will undergo final reclamation and can be re-contoured to restore the original landform.

2.1.8.2 Reclamation - Disturbance Over Facility Lifetime

a. Final reclamation actions will be completed within 6 months of well plugging, season and weather permitting.

b. At the end of project operations, wells will be plugged and abandoned as required by NDOM regulations and BLM.

c. Areas to be reclaimed will be ripped, tilled, or disked on contour, as necessary. Pipeline reclamation will include placing fill in the trench, fill compaction, re-grading cut-and-fill slopes to restore the original contour, replacing topsoil and revegetation.

d. Disturbed areas will be reseeded with a diverse mix of perennial native or introduced plant species.

e. Refuse, junk, trash, tools, residual material, or personal property will be removed from the site prior to restoration work. Refuse and trash will be collected in a closed container until removed from site and disposed of in an approved manner. Oils and fuels will not be discharged to the ground surface. Waste oils or chemicals will be collected and hauled to an approved site.

f. All other above-ground facilities and areas of surface disturbance associated with geothermal development will be removed and reclaimed.

2.2 TRANSMISSION LINE

2.2.1 Project Description

The Hot Sulphur Springs Transmission Line (Transmission Line) is a 24.5-mile, 120kV electric power transmission line that would deliver power from the Tuscarora Facility to NV Energy's Humboldt Substation. An EA for Transmission Line was completed in 2008 (*T G Power LLC Hot Sulphur Springs Transmission Line, 120 kV Electric Power Line, Northern Independence Valley, Elko County, Nevada),* and is incorporated by reference. (BLM, 2008a) Figure 6 shows the general route of the Transmission Line.

Approximately 16 miles of the Transmission Line would be located on private lands. The remaining 8.5 miles would be located on public land administered by the BLM. The transmission line would be constructed within a 150-foot corridor. The total area within the corridor would be approximately 445 acres. Of that total, approximately 152 acres would be public lands and 293 acres would be private land. Total surface disturbance would be approximately 108 acres. A summary of temporary and permanent surface disturbance associated with the Transmission Line is shown in Table 3.

Approximately 265 power poles would support the Transmission Line, and consist of 256 wood single-pole structures, and 9 wood triple-pole structures. The average distance between structures would be approximately 400 feet. However, spans as long as 1,500 feet would be possible for crossing steep canyons and avoiding areas of environmental concern. Single-pole structures would primarily be used, with multiple poles structures necessary for long spans, at angles, and significant elevation change locations. Topography would be the main criteria for

determining the most advantageous and safe configuration for the power pole installations. Some of the pole locations would require the use of anchors and guy wires.

Table 3 Summary of Surface Disturbance: Transmission Line

Description	On BLM Land	On Private Land	All Land (Total)
Acres of Temporary Disturbance from Transmission Line Construction	30.5	51.1	81.6
Acres of Temporary Disturbance from Material Staging/Turn-Around Areas	4.2	0.0	4.2
Subtotal	**34.7**	**51.1**	**85.8**
Acres of Permanent Disturbance from Power Plant Road (Right-of-Way)	4.4	9.5	13.9
Acres of Permanent Disturbance from Maintenance Road (overland travel)	4.3	3.5	7.8
Subtotal	**8.7**	**13.0**	**21.7**
ACRES OF TOTAL DISTURBANCE:	**43.4**	**64.1**	**107.5**

Note that overland travel, as used in Table 3, assumes a disturbance width of six feet

Anti-perching devices would be used where appropriate to avoid increasing perching opportunities for raptors that may prey on sage-grouse and other wildlife species. These anti-perching deterrents would be installed in a manner that would prevent a base for predatory bird nests. Visual collision deterrent devices (bird flight diverters) would be installed on the transmission line where the proposed ROW runs near sage-grouse leks and within or near riparian and wetland areas to reduce potential for collisions associated with sage-grouse and other bird species flying into the line. Anti-perching and collision deterrent devices would be tailored to site-specific conditions, such as average wind speed and line height, and would conform to NV Energy's specifications. The devices would be maintained for the life of the project.

A 2.5-mile road would provide access for maintenance of a portion of the Transmission Line and as the main access road from SR 226 to the Tuscarora Facility. The road is intended to minimize traffic through the Spanish Ranch during construction and operation of the power plant. East of the power plant site, the access road would be diverted from the transmission line route for the 1.5 miles between the power plant and Harrington Creek in order to follow existing contours and reduce the amount of surface disturbance. The Transmission Line and access road would then join and remain together the remaining distance to SR 226. The new road would have a 22-foot running width, and a 36-foot disturbance width. Construction would result in 4.4 acres of

disturbance on public lands, and 9.5 acres of disturbance on private land. Additional detail on the Transmission Line is included in the Transmission Line EA. (BLM, 2008a).

2.2.2 Supplemental Adopted Environmental Protection Measures

In addition to those proposed for the Tuscarora Facility, ORMAT has also incorporated a number of supplemental EPMs into the Transmission Line project to further reduce environmental impacts, ensure protection of cultural and biological resources, and comply with regulatory protective and monitoring requirements of applicable permits and plan approvals. These EPMs supplement those contained in section 2.1.8 of the *Environmental Assessment – T G Power LLC Hot Sulphur Springs Transmission Line, 120 kV Electric Power Line, Northern Independence Valley, Elko County, Nevada.* Bureau of Land Management, Elko Field Office, March 2008 (BLM, 2008a). The following sections describe the supplemental EPMs incorporated in the Transmission Line, which ORMAT has committed to implement.

2.2.2.1 Cultural Resources

On June 20, 2011 the BLM, DOE, ORMAT and the Nevada Historic Preservation Officer (SHPO) signed a Memorandum of Agreement under which ORMAT will prepare an Historic Preservation Treatment Plan to document, monitor and protect 23 historic properties that may be adversely affected by construction of the Transmission Line. (BLM, 2011b) The final MOA is contained in Appendix D.

2.2.2.2 Threatened, Endangered, and Sensitive Species

Habitat for the greater sage grouse is present throughout the Transmission Line area. The greater sage grouse on the list of candidate species for Endangered Species Act protection. Habitat fragmentation and destruction have occurred across much of the species' range and, if current trends persist, many local populations may disappear in the next several decades. In response to these trends, the Greater Sage Grouse Conservation Measures Implementation Plan was prepared by ORMAT, BLM, NDOW and DOE. The Implementation Plan, presented in Appendix A, provides a number of measures to be included as part of the Tuscarora Facility and Transmission Line projects to protect sage grouse.

2.2.2.3 Public Health and Safety

DOE believes that the Transmission Line is an unlikely target for intentionally destructive acts (terrorism or sabotage) and will have an extremely low probability of being attacked. In the unlikely event of an intentionally destructive act, the managing utility (NV Energy) will initiate emergency response measures in the same way it will for an accidental incident.

2.2.3 Supplemental Project Decommissioning and Site Reclamation

The Transmission Line will be constructed, operated, and maintained by ORMAT. Intermediate and final reclamation is required for 24.5 miles of power transmission line, located on private land, and BLM managed properties. All disturbed areas resulting from the project will be reclaimed in accordance with the requirements of 43 CFR 3200. Interim reclamation of the project to the extent practicable will occur throughout the project life. Final reclamation will involve removal of the facility and all associated equipment and will occur at the time of facility decommissioning.

2.2.3.1 Reclamation – Temporary Disturbance

a. Temporary areas of disturbance will be re-contoured to match the surrounding terrain. Areas to be reclaimed will be ripped, tilled, or disked on contour, as necessary. Construction sites, material storage yards, and access roads will be kept in an orderly condition and free of trash.

b. Refuse, junk, trash, tools, residual material, or personal property will be removed from the transmission line right-of-way prior to restoration work. Refuse and trash will be collected in a closed container until removed from the right-of-way and disposed of in an approved manner. Oils and fuels will not be discharged to the ground surface. Waste oils or chemicals will be collected and hauled to an approved site.

c. Interim reclamation stormwater management actions will be taken to ensure disturbed areas are quickly stabilized to control surface water flow and to protect both the disturbed and adjacent areas from erosion and siltation.

2.2.3.2 Reclamation –Disturbance Over Facility Lifetime

a. Poles, conductors, and hardware associated with the transmission line will be totally removed. The remaining holes will be filled with soil gathered within the approved permanent right-of-way. Disturbed areas will be re-contoured and revegetated.

b. Areas to be reclaimed will be ripped, tilled, or disked on contour, as necessary and revegetated. Revegetation will include site appropriate seed mixtures for various ecological site types encountered. Disturbed areas will be reseeded with a diverse mix of perennial native or introduced plant species.

c. Areas where the poles were removed will be raked to match the surrounding topography. Bladed areas will be re-contoured and revegetated with site appropriate seed mixtures for various ecological site types encountered. Disturbed areas will be reseeded with a diverse mix of perennial native or introduced plant species.

d. Noxious weeds, invasive weeds, and non-native species seeds listed in the Nevada Designated Noxious Weed List (Nevada Administrative Code 555.010) or prohibited by the

Federal Seed Act (7 CFR Part 201) will be excluded from seed mixtures. Seed mixtures will be subject to the approval of the BLM.

e. Refuse, junk, trash, tools, residual material, or personal property will be removed from the transmission line right-of-way prior to restoration work.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

2.3.1 Alternative Sites

Siting and development of geothermal facilities rely on the location of a proven geothermal resource. ORMAT obtained the leases for the Tuscarora Facility site because of the previous exploration history and knowledge of the resource. The Hot Sulphur Springs area was the primary site indicating sufficient temperature characteristics for geothermal development. For this reason, no alternatives for development of the geothermal resource or facility site have been identified.

2.3.2 Transmission Line

An alternative to the proposed transmission line was evaluated under which the number of transmission line poles in the vicinity of sage-grouse habitat would be reduced by increasing the spacing of the poles, which would also require increasing the height of the poles. The purpose of this measure would be to 1) reduce the potential for raptors and ravens to perch and prey on sage-grouse in prime habitat areas and 2) reduce sage-grouse avoidance as sage-grouse tend to avoid areas where high structures, such as poles, are located. After consideration by BLM and other participating agencies, DOE concluded that there was insufficient technical or scientific data available to demonstrate that the alternative might reduce impacts to sage grouse. For example, the taller poles and higher position of the power cables could make the sage grouse more susceptible to depredation because raptors and corvids might be able to see sage grouse activities from a greater distance from those higher structures. Accordingly, this alternative was eliminated from further study.

2.3.3 Alternative Access

An alternative was considered under which the primary access to the project site would be via the Spanish Ranch Road. The alternative was considered because use of the existing road would not create any new surface disturbance, in contrast to proposed access road. In addition, it would generate less noise and impacts to prime sage grouse habitat during construction and during operation of the power plant. On the other hand, the use of the Spanish Ranch Road would generate additional traffic, dust, and noise to the residents of the ranch complex and increase safety risks to the residents there, including children. Additional concerns by the Ranch included disruption to the movement of livestock between grazing areas.

Although the Spanish Ranch Road alternative would result in fewer negative impacts to the environment, especially sage grouse habitat, the owners of the Spanish Ranch refused to allow the Spanish Ranch Road to be used for major construction operations and long-term operations at the plant. Accordingly, this alternative will not be analyzed in greater detail in this document.

2.4 NO ACTION ALTERNATIVE

Under the No Action Alternative, the DOE would not issue a loan guarantee for the proposed geothermal facility. While the facilities might be built with other financing, for purposes of this analysis it is assumed that the facility would not be completed or become operational.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment and predicted environmental consequences of the Proposed Action and No Action Alternative. Consistent with the objectives of this EA as outlined in section 1.2, the description of the affected environment and analysis of environmental consequences will have two primary areas of focus: 1) the assessment of new impacts associated with Tuscarora Facility (presented in section 3.1), and 2) a summary of the information and analysis for the Transmission Line contained in *Environmental Assessment – T G Power LLC Hot Sulphur Springs Transmission Line, 120 kV Electric Power Line, Northern Independence Valley, Elko County, Nevada, March 2008,* along with supplemental information or analysis available after publication of the 2008 EA (presented in section 3.2). The analysis for the Jersey Valley Facility, from the *Jersey Valley Geothermal Development Project, Pershing and Lander Counties, Nevada – Environmental Assessment, Battle Mountain District Office, May 2010,* is summarized in Appendix B. The analysis for the McGinness Hills Facility, from the *McGinness Hills Geothermal Development Project, Lander County, Nevada – Environmental Assessment, Battle Mountain District Office, June 2011,* is summarized in Appendix C.

3.1 TUSCARORA FACILITY

Phase I of the Tuscarora Facility would consist of a 19 net megawatt electrical generating facility, production and injection wells, and ancillary facilities. The power plant would be located in Elko County, Nevada approximately 70 miles north of Elko, Nevada in Independence Valley (Figure 2). Features of the Tuscarora Facility are described in detail in section 2.1.

Table 4 identifies the resources to be addressed for the Tuscarora Facility. For each resource, the table indicates a) if the resource is present and b) if the resource would be affected by the Tuscarora Facility. For those elements that would not be affected by the Tuscarora Facility, no further discussion is provided in this EA.

Table 4 Resources Relevant to the Tuscarora Facility

Element	Present	Affected	EA Section
Air Quality	Yes	Yes	Section 3.1.1
Geology and Minerals	Yes	No	Section 3.1.2
Soils	Yes	Yes	Section 3.1.3
Water Resources	Yes	Yes	Section 3.1.4
Vegetation	Yes	Yes	Section 3.1.5
Invasive Non-Native Species and Noxious Weeds	Yes	Yes	Section 3.1.6
Wildlife	Yes	Yes	Section 3.1.7
Fish Habitat	Yes	Yes	Section 3.1.7

Element	Present	Affected	EA Section
Migratory Birds	Yes	Yes	Section 3.1.7
Threatened and Endangered Species	Yes	Yes	Section 3.1.8
Wetlands and Waters of the United States	Yes	Yes	Section 3.1.9
Cultural Resources	Yes	Yes	Section 3.1.10
Native American Religious Concerns	Yes	Yes	Section 3.1.10
Solid or Hazardous Waste	Yes	Yes	Section 3.1.11
Noise	Yes	Yes	Section 3.1.12
Visual Resources	Yes	Yes	Section 3.1.13
Land Use	Yes	Yes	Section 3.1.14
Socioeconomic Resources	Yes	Yes	Section 3.1.15
Environmental Justice	No	No	Section 3.1.16
Human Health and Safety	Yes	Yes	Section 3.1.17
Floodplains	No	No	No FEMA-designated 100-year floodplains are located near the project.
Wild and Scenic Rivers	No	No	No wild and scenic rivers present.
Wilderness	No	No	No wilderness areas present.
Paleontological Resources	Yes	No	Because no excavation of geologic structures would occur, no paleontological resources would be impacted.
Recreation	No	No	Recreation limited due to private land. May be some negligible visual impacts from adjacent BLM to the west of the project site.
Areas of Critical Environmental Concern[4]	No	No	No Areas of Critical Environmental Concern present.
Prime and Unique Farmland	No	No	The project area has no prime or unique farmland subject to the Farmland Protection Policy Act (7 USC 4201 et. seq., as amended).
Wild Horses and Burros	No	No	No wild horses or burros present.

Based on the information in Table 4, the following resources are analyzed in this EA for the Tuscarora Facility.

- Air Quality
- Geology and Minerals
- Soil Resources
- Water Resources

[4] Areas of Critical Environmental Concern is a BLM land use designation authorized in the 1976 Federal Lands Policy and Management Act (FLPMA). The FLPMA mandate directs the BLM to protect important riparian corridors, threatened and endangered species habitats, cultural and archeological resources, and unique scenic landscapes that the agency assesses as in need of special management attention..

- Biological Resources
- Threatened, Endangered, and Sensitive Species
- Wetlands and Waters of the United States
- Cultural Resources and Native American Religious Concerns
- Transportation of Hazardous Materials
- Noise
- Visual Resources
- Land Use
- Socioeconomic Resources
- Environmental Justice
- Human Health and Safety

This section includes a description of the affected environment for the Tuscarora Facility. ORMAT has incorporated the EPMs described in Section 2.1 to reduce or eliminate potential impacts to the environment. The Tuscarora Facility plant site and wells would disturb approximately 62.8 acres of land currently used for grazing.

3.1.1 Air Quality

3.1.1.1 Affected Environment

The Tuscarora Facility is located in an unclassified area, and thus is considered by NDEP-BAPC to be in attainment for all Nevada BAPC criteria air pollutants. The Tuscarora Facility is also within a designated Prevention of Significant Deterioration (PSD) Class II area, which allows for moderate incremental increases in emission concentrations as long as the concentrations do not exceed standards set by the State of Nevada and the Environmental Protection Agency. The location of the project is not within a PSD-triggered area[5]. There are no industrial sources of air pollutants in the immediate vicinity. The closest source of industrial air pollutants is the Jerritt Canyon Mine located approximately 10 miles east of the Tuscarora Facility.

3.1.1.2 Environmental Consequences

Proposed Action

The primary pollutants of concern during construction of the power plant site are fugitive dust from cleared areas, vehicles traveling on unimproved roads, and emissions from vehicles and equipment. Ground-disturbing activities include grading, well pad construction, road construction, transmission line construction, and transportation. These fugitive dust emissions would result in short-term impacts, occurring primarily during construction. Once the power plant is operational and interim reclamation completed, fugitive dust emissions would be limited to the 10 vehicles per day expected to travel on the access road.

[5] EPA program in which state and/or federal permits are required in order to restrict emissions from new or modified sources in places where air quality already meets or exceeds primary and secondary ambient air quality standards.

Combustion emissions of criteria air pollutants [nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), and particulate matter less than or equal to 10 microns in diameter (PM10)], criteria air pollutant precursors [volatile organic compounds (VOCs)] and air toxics (small quantities of diesel PM, acetaldehyde, benzene, and formaldehyde) would be released from diesel engines used during well drilling and construction activities. Impacts resulting from this short-term emissions are expected to be minimal.

Small quantities of naturally occurring non-condensable gases, such as carbon dioxide (CO2), hydrogen sulfide (H2S), nitrogen (N2), and methane (CH4), would be emitted to the air during geothermal well testing. Carbon dioxide is a greenhouse gas. Although the Tuscarora Facility would contribute to an increase in greenhouse gases in the atmosphere, these emissions would be extremely small relative to state, national, and global greenhouse gas emissions. Any resultant effects would also be extremely small and cannot be reliably estimated.

With a binary power plant, some of the binary working fluid (pentane) would be released to the atmosphere from gaskets, rotating seals, and flanges during operations. During normal operations, a small quantity of air would enter the pentane loop in the air-cooled condenser. This air leaked into the pentane loop would be discharged back to the atmosphere through a stack, along with a small quantity of pentane. During major maintenance activities on the pentane side of the binary power plant units, the liquid pentane would first be transferred to the pentane storage tank. However, not all of the pentane can be removed in this manner, and the residual pentane would escape to the atmosphere when the binary power plant unit is opened for repair. All of these releases, estimated to average about 12 tons per year, are regulated through a permit issued by BAPC to ensure that these emissions do not result in ambient concentrations of ozone (which can be created from the reaction of ambient concentrations of hydrocarbons and NOx) in excess of the applicable federal ambient air quality standards (AAQS).

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to air quality.

3.1.2 Geology and Minerals

3.1.2.1 Affected Environment

The Tuscarora Facility area is underlain by Paleozoic and Cenozoic deposits, as shown in wells drilled in the area. The Paleozoic deposits include Ordovician to Mississippian siliciclastics, volcanic, and limestones, which range in age from 500 to 320 million years. Cenozoic volcanic deposits lie unconformably above the Paleozoic rocks. These deposits range in age from 34 to 5 million years. Quaternary alluvial deposits (up to 10,000 years ago) can be found in the

topographically low areas. Calcareous and silica sinter deposits are found near current and extinct hot springs.

The area also has several faults that show a horst and graben structure (uplifted blocks next to down-dropped blocks) along Hot Creek. The Hot Creek area is believed to lie in the graben, or down-dropped block. The faults controlling the horst and graben features trend in a north-south direction. In addition to the north-south trending horst and graben faults, a major fault trends in a northeasterly direction along the range front.

The geologic conceptual model of the geothermal system includes upward movement of geothermal fluids along the vertical fractures bounding the horst and graben structures. These geothermal fluids reach the surface and daylight as hot springs.

3.1.2.2 Environmental Consequences

Proposed Action

The Tuscarora Facility is not expected to induce seismic events because the project is designed to balance geothermal reservoir pressures, not increase pressure or induce rock fracture. The facility involves water temperatures, flow, and geologic conditions that are typical of binary cycle geothermal power projects that have been operating in California, Nevada, and Idaho without incident. The water recharge techniques used in binary cycle projects have not been shown to induce seismic events and therefore make seismic events much less likely than those used for geothermal projects that involve increasing pressure in the underground reservoir or fracturing rock (these are called "enhanced geothermal projects").

The Tuscarora Facility involves the binary cycle technology that pumps water from known geothermal reservoirs that are located along localized, near surface, fractures or faults, extracting the heat, and then injecting the water back into the reservoir to maintain a constant pressure. Enhanced geothermal systems, by contrast, involve injecting water from the surface into deep formations of hot, dry rock in order to induce rock fracturing and production of heated water that can be pumped to the surface to extract the heat.

There are several reasons why the binary cycle technology has a lower seismic risk than enhanced geothermal systems. First, there is a much lower differential between the reservoir temperature (≤ degrees F) and the injection water (approximately 350 degrees F). Also, in a binary system the injection and pumping are shallow, relative to regional fault zones and earthquake activity. For example, reservoir and injection zones at the Tuscarora Facility are between 3,000 and 5,000 feet, compared to the estimate that an injection greater than 3 miles deep that is associated with some enhanced geothermal projects

Finally, a binary system is designed to intercept an existing flow path, not to create new rock fracture as is done in an enhanced system. The goal of geothermal reinjection is to balance, not increase, the fluid and pressure within the geothermal system in order to ensure long-term geothermal production.

Although the Tuscarora Facility wells would be drilled into an existing fault, drilling would not have effects on the fault or induce seismicity. Construction would have no effects on tectonics or geology in the project region. Construction of the power plant and pipeline would require some ground disturbance but would not encounter bedrock or induce a seismic event.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to geology or mineral resources.

3.1.3 Soils

3.1.3.1 Affected Environment

Based on information obtained from the USDA Natural Resources Conservation Service (NRCS), there are eight soil associations within the Tuscarora Facility area. (NRCS, 2010) These soil associations are shown on Figure 7 and described below.

Welch, drained-Welch Association

The Welch, drained-Welch Association is typically found at elevations ranging from 5,000 feet to 7,000 feet above mean sea level (AMSL). The composition of this association includes 70 percent Welch soils, 15 percent drained-Welch soils, and 5 percent minor components. The Welch, drained-Welch soils are very similar except the Welch soils are indicated as occurring in loamy bottom ecological sites, which are rarely flooded, and drained-Welch soils occur in wet meadow ecological sites, which are frequently flooded. The depth of Welch, drained-Welch soils is typically greater than 80 inches and these soils are very poorly drained. The parent material for these soils is alluvium derived from mixed rocks. These soils are only found along Hot Creek within the Tuscarora Facility area.

Chen-Graley-Quarz Association

The Chen-Graley-Quarz Association is typically found at elevations ranging from 6,200 feet to 6,600 feet AMSL. The composition of this association includes 40 percent Chen soils, 30 percent Graley soils, and 15 percent Quarz soils. Chen soils are typically found on slopes of 15 percent to 50 percent. The depth to bedrock in the Chen soils is typically 12 to 20 inches. The parent material for these soils is residuum and colluviums derived from volcanic rocks. Graley soils are found on hills with slopes ranging from 15 percent to 50 percent. Depth of soils range from 14 inches to 20 inches and are well drained. The parent material is residuum derived from

volcanic rocks. Quarz soils are found on slopes ranging from 30 percent to 50 percent. Depth of these soils is between 20 inches and 40 inches and the soils are well drained. The parent material is residuum and colluviums derived from volcanic rock. The Chen-Graley-Quarz Association is found to the west of Hot Creek and east of an unnamed drainage that confluences with Hot Creek near the proposed well 53-8, as shown on Figure 7.

Chen-Cotant-Graley Association

The Chen-Cotant-Graley Association is typically found at elevations ranging from 5,200 feet to 7,000 feet AMSL. The composition of this association includes 40 percent Chen soils, 35 percent Cotant soils, and 15 percent Graley soils. The Chen and Graley soil descriptions are provided above. Cotant soils are found on slopes ranging from 4 percent to 15 percent. Depth of these soils is between 12 inches and 20 inches and the soils are well drained. The parent material is residuum derived from tuffaceous rocks. The Chen-Cotant-Graley Association is found to the east of Hot Creek and is the soil association present at the proposed power plant site, as shown on Figure 7.

Cotant-Booford Association

The Cotant-Booford Association is typically found at elevations ranging from 5,700 feet to 6,000 feet AMSL. The composition of this association includes 65 percent Cotant soils and 30 percent Booford soils. The Cotant soils description is provided above. Booford soils are found on shallow slopes of 2 percent to 8 percent. Depth of these soils is between 20 inches and 40 inches and the soils are well drained. The parent material is residuum and colluviums derived from tuffaceous rocks. The Cotant-Booford Association is found to the west of Hot Creek, as shown on Figure 7.

Tweener–Sumine-Cleavage Association

The Tweener-Sumine-Cleavage Association is typically found at elevations ranging from 5,000 feet to 7,500 feet AMSL. The composition of this association includes 30 percent Sumine soils, 30 percent Tweener soils, 25 percent Cleavage soils and 5 percent minor components. Tweener soils are typically found on mountain slopes of 15 percent to 50 percent. The depth to bedrock in the Chen soils is typically 7 to 14 inches and these soils are well drained. The parent material is residuum and colluviums derived from volcanic rocks. Sumine soils are found on mountain slopes ranging from 15 percent to 50 percent. Depth of soils range from 20 inches to 40 inches and are well drained. The parent material is residuum and colluviums derived from volcanic rocks. Cleavage soils are found on mountain slopes ranging from 15 percent to 50 percent. Depth of these soils is between 14 inches and 20 inches and the soils are well drained. The parent material is residuum derived from volcanic rocks. The Tweene-Sumine-Cleavage Association is found to the northeast of the proposed plant site, as shown on Figure 7.

Upville, Frequently flooded-Upville

The Upville, frequently flooded-Upville Association is typically found at elevations ranging from 5,700 feet to 6,000 feet AMSL. The composition of this association includes 55 percent Upville gravelly loam that is frequently flooded, and 35 percent Upville gravelly loam. There are also several inclusions associated with drainages that make up approximately 10 percent of the association. This association is typically found in intermontane basins and consists of gravelly loam that is well drained. The parent material for this association is alluvium derived from mixed rocks. This association is found primarily in the irrigated lands along Harrington Creek.

3.1.3.2 Environmental Consequences

Proposed Action

The total ground disturbance associated with the geothermal power plant site would be approximately 62.8 acres. This includes the plant site, pipeline, and well pad disturbance. Disturbance associated with the transmission line and access road is addressed in a separate EA (BLM, 2008a).

Of the 62.8 acres of disturbance that would occur with implementation of the Tuscarora Facility, approximately 19.3 acres have already been disturbed during previous and current exploration and drilling operations (pad creation), and site grading for a portion of the plant site. Development of the Tuscarora Facility would result in 43.5 acres of new disturbance to soils. All of the proposed new disturbance would be associated with construction of pipelines from the geothermal production wells (0.8 acres) to the injection wells (10.0 acres), two fresh water well (12.7 acres), or expansion of the existing pad for the power plant (14 acres). Of the 43.5 acres of new disturbance, approximately 16.5 acres would be temporary disturbance created during construction of the pipeline. This area would be reclaimed immediately following construction. New long-term disturbance would be associated with the pipeline (7.0 acres) and power plant site (20 acres).

Disturbance to the soils would include destruction of the soil structure in areas where grading is required. This would increase the susceptibility of the soils to wind and water erosion, resulting in soil loss from erosion. In areas where grading is not required but traffic would be present, soils would be compacted and vegetation may be destroyed. This would result in increased susceptibility to wind and water erosion.

The majority of the impacts to soils would occur in the Chen-Cotant-Graley Association (37.8 acres). Other soils associations impacted by the Tuscarora Facility would include Chen-Graley-Quarz Association (2.6 acres); Welch, drained-Welch Association (1.3 acres), and Upville frequently flooded Association (1.8).

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to soil resources.

3.1.4 Water Resources

3.1.4.1 Affected Environment

Surface Water

The primary surface water resources in the Tuscarora Facility area is Hot Creek, a perennial stream that runs north to south through the area, and Harrington Creek, which flows to the east of the proposed power plant facility and joins Hot Creek south of the project area (Figure 8). This is a cold-water creek above the Hot Sulphur Springs area. The hot springs contribute a significant amount of water to Hot Creek increasing the temperature significantly. Hot Creek is also deeply incised, in some areas greater than eight feet, below the hot springs. Hot Creek continues to flow south and to its confluence with the South Fork Owyhee River approximately 3.5 miles south of the Tuscarora Facility. Hot Creek is a perennial creek that is fed through fresh water springs, precipitation, snowmelt, and hot springs.

Flows in Hot Creek are currently being monitored by ORMAT on a monthly basis at three locations: upgradient of the hot springs; immediately downgradient of the large cluster of hot springs; and downgradient of all the springs associated with Hot Creek. The three sites are shown in Figure 8. Flows measured are shown in Table 5. The data indicates the main concentrations of hot springs contribute approximately 300 gpm or more to Hot Creek.

Table 5 Hot Creek Stream Flow Data

Sample Location	October 2010 Flow (gpm)	November 2010 Flow (gpm)	December 2010 Flow (gpm)	January 2011 Flow (gpm)
HC-1	37.0	0.0, stream frozen	78.8	194.3
HC-2	369.1	312.7	496.8	484.3
HC-3	540.1	299.8	541.7	1494.9

There are also several unnamed tributaries to Hot Creek within the Tuscarora Facility area, which are ephemeral and flow in response to significant precipitation and snowmelt. There are also several diversion channels along Hot Creek, which allows the Spanish Ranch to withdraw water from Hot Creek for irrigation purposes.

Seeps, springs, and associated meadows on public lands surrounding the Tuscarora Facility are important sage-grouse brood rearing habitat. BLM PWR 05598 is located in T41N R52E Section 17 NE1/4) and in the vicinity of the Tuscarora Facility site. The approximate UTM for the spring is 4589500N 570750E. Flows in the spring were recorded at 3 gallons per minute (gpm) at 74

degrees F on 9/9/1982. Field observations by BLM staff during a visit to the site on 6/24/11, estimated flows in the spring considerably in excess of 3 gpm, and possibly as high as 6 gpm. Local geology indicates the spring is probably associated with a perched aquifer that is not connected to the local groundwater system.

Groundwater

Several groundwater systems are present in the Tuscarora Facility area. The geothermal reservoir is artesian (i.e., the pressure in the reservoir is strong enough to allow discharge of hot water at the surface and for a lateral flow of the hot water from the reservoir to mix with the local groundwater system). This is possible because the local groundwater system is relatively shallow in the alluvium within Independence Valley. Several water wells used for testing the aquifer were drilled south of the Tuscarora Facility site. Water depths in the alluvium at this location were approximately 65 feet below ground surface. Fresh water aquifers within the foothills to the west are primarily fracture-controlled systems. These facture-controlled aquifers are likely tied to recharge through precipitation events. These systems are typically not affected by the withdrawal of water or geothermal fluid from alluvial aquifers or deep geothermal systems.

In the production zones, geothermal systems are geologically separated from the groundwater systems. Geothermal wells are designed to protect the integrity of these zones with a sealing around the casing of the well to prevent downward movement of higher aquifers to deeper geothermal aquifers. In addition, the perforated zone of the casing is only within the aquifer from which fluid is being withdrawn, thus maintaining the isolation of the geologic zones.

3.1.4.2 Environmental Consequences

Proposed Action

Surface Water

Impacts to surface waters are primarily associated with increased sedimentation to Hot Creek from disturbance adjacent to the creek. This impact would typically be controlled through implementation of BMPs described in Section 2.1.7. With implementation of BMPs, sedimentation in Hot Creek would be minimized.

Operational management practices are designed to maintain productivity and longevity of the geothermal resource field by manipulating volume, pressure, and temperature at specific injection locations. This return of geo-fluid and recirculation through the system should continue pressure in the entire geothermal system including surface expressions of the geothermal resource at the existing hot springs. However, it is conceivable a potential impact could reduce water flow from the hot springs into Hot Creek. Reduced flow would be a result of volumetric losses associated with geo-fluid heat losses or injection or operations systems reducing pressure

support for surface geo-fluid flows. If reduced hot spring flow were to occur, this could impact the volume of water available to use for irrigation by the Spanish Ranch.

If reduced flow from the hot springs occurs, ORMAT would develop measures to ensure sufficient water is available to the Spanish Ranch for irrigation. This supplemental water would either consist of supplying geothermal fluid to the ranch from the injection lines, supplying groundwater from the fresh water well, or another method agreed upon by ORMAT and the Spanish Ranch. Because most of the flow in both Harrington Creek and Hot Creek are diverted for irrigation purposes by the Spanish Ranch, no impacts to the flow into the Owyhee River are anticipated. ORMAT would ensure through the use of supplemental flow from the power plant that reduced flows are not realized either for irrigation purposes by the ranch or base flow to the Owyhee River.

If the Tuscarora Facility's use of geothermal waters or other groundwater decreases the supporting flows and availability of sage-grouse habitat, the dependent sage-grouse would be impacted. To minimize this risk, ORMAT will monitor the flow rates of PWR 05598 and several other springs for a minimum of five years. If the flow at the PWR drops to less than 1 gpm, ORMAT will construct a pipeline to supply fresh water sufficient to restore flow from the spring to 3 gpm. Additional information on these measures is contained in section 2.1.7.4 and Appendix A.

Groundwater

Water flow from the geothermal reservoir is not expected to be impacted by the Tuscarora Facility primarily because that fluid would be injected back into the aquifer following use of the heat from the fluid. The proposed plant would use a binary system, a closed system that transfers heat from the geothermal fluid to a motive fluid, pentane, without the geothermal fluid coming into contact with the motive fluid or the atmosphere. The heat is transferred to the motive fluid through a heat exchanger and then injected back into the geothermal aquifer zone. Thus, the same volume of fluid pumped from the geothermal aquifer is returned to the geothermal aquifer. There is a potential for the hot water in the geothermal reservoir and associated surface waters to cool over the life of the project because using fluid for power generation cools it by approximately 180 degrees. Cooling of the resource is dependent on the underground heat source, which is heating the fluid and the depth to which the cooled fluid is injected. Cooling of the geothermal resource has the potential to shorten the life of the project. Modeling of the resource by ORMAT suggests that cooling should not be a problem.

One concern of the Spanish Ranch is the potential impact of withdrawing approximately 1,200 gpm of groundwater in the vicinity of a nearby spring used to supply water for livestock. The groundwater required for the Tuscarora Facility cooling system would be obtained from two

wells owned by the Ranch, and located approximately two miles south of the power plant. The ranch has agreed to allow ORMAT use the water on the condition that ORMAT replenish the water if withdrawal of groundwater impacts the spring.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to surface water or groundwater resources.

3.1.5 Vegetation

3.1.5.1 Affected Environment

Sagebrush steppe communities typical to the Owyhee watershed dominate the Tuscarora Facility area. Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Montane Sagebrush Steppe, and Great Basin Xeric Mixed Sagebrush Shrubland community types occupy the majority of area as shown on Figure 9. Inter-Mountain Basins Big Sagebrush Shrubland and Inter-Mountain Basins Montane Sagebrush Steppe communities are dominated by big sagebrush (*Artemisia tridentata* ssp.) and rabbitbrush (*Ericameria viscidiflorus*) with lesser amounts of Saskatoon serviceberry (*Amelanchier alnifolia*), antelope bitterbrush (*Purshia tridentata*), Nevada biscuitroot (*Lomatium nevadense*), silvery lupine (*Lupinus argenteus* var. *heteranthus*), and annuals including blue-eyed Mary (*Collinsia parviflora*), and cryptantha (*Cryptantha* sp.). Great Basin Xeric Mixed Sagebrush Shrubland is characterized by the low sagebrush (*Artemisia arbuscula*) community type, including associates species Hood's phlox (*Phlox hoodii*), arrowleaf balsamroot (*Balsamorhiza sagittata*), Indian ricegrass (*Achnatherum hymenoides*), and bottlebrush squirreltail (*Elymus elymoides*). (NRCS, 2007)

3.1.5.2 Environmental Consequences

Proposed Action

Implementation of the Tuscarora Facility would result in the disturbance of approximately 62.8 acres of vegetation. Approximately 19.3 acres have been previously disturbed during exploration and development drilling. Development of the project would disturb an additional 43.5 acres. The disturbance would affect the Inter-Mountain Basins Big Sagebrush Shrubland (18.6 acres), Great Basin Xeric Mixed Sagebrush Shrubland (24.4 acres) and Inter-Mountain Basins Montane Sagebrush Steppe (0.5 acres) habitat types. Following initial construction, 16.5 acres of the disturbance along the pipeline would be reclaimed, thus long-term disturbance to vegetation would affect 46.3 acres. This long-term disturbance would be for the life of the power plant, estimated at 20 years.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to vegetation resources.

3.1.6 Invasive Non-Native Species and Noxious Weeds

3.1.6.1 Affected Environment

Noxious weeds within Nevada are defined in Nevada Revised Statutes 555.005 as "any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate." The University of Nevada Cooperative Extension provides a list of all weeds currently listed as noxious for the State of Nevada (UNCE, 2008). Invasive non-native plant species are defined as alien species whose introduction is likely to cause economic or environmental harm or harm to human health (NISC, 2010). Invasive species often displace native species and become dominant, in turn affecting native flora, wildlife, watersheds, fire regimes, and recreation. No state-listed noxious weed species were observed at the project site during the surveys.

Invasive non-native species cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), curveseed butterwort (*Ceratocephala testiculata*), purple mustard (*Chorispora tenella*), filaree (*Erodium cicutarium*), clasping peppergrass (*Lepidium perfoliatum*), herb Sophia (*Descurainia sophia*), and halogeton (*Halogeton glomeratus*) were common in areas adjacent to roads and other disturbed areas used for recreation and geothermal exploration and by livestock. Invasive non-native species rabbitsfoot grass (*Polypogon monspeliensis*), curly dock (*Rumex crispus*), and bull thistle (*Cirsium vulgare*) were common in wetted areas near drainages, seeps, and springs.

3.1.6.2 Environmental Consequences

Proposed Action

Disturbance associated with the Tuscarora Facility has the potential to create conditions favorable for invasive non-native species and noxious weeds by removing native vegetation, increase traffic from areas that may contain these weeds, thus transporting the seeds to the project area. Proposed disturbance would directly impact approximately 62.8 acres of primarily sagebrush habitats, thus leaving these areas susceptible to invasive non-native species and noxious weeds. In addition, vehicles entering the site that may have traveled in areas with noxious weeds or invasive species have the potential to transport of weed seeds to areas within the project area. With the implementation of the EPMs discussed in Section 2.1.7.3 (a noxious weed control plan and washing vehicles to remove seeds) and successful reclamation of temporary disturbed areas, impacts from invasive non-native species and noxious weeds is expected to be minimal.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts related to invasive, non-native species or noxious weeds.

3.1.7 Wildlife

3.1.7.1 Affected Environment

The Tuscarora Facility lies within the Columbia Plateau ecoregion and is comprised primarily of sagebrush habitat. Sagebrush has been identified by NDOW's Wildlife Action Plan as a key habitat for wildlife conservation (WAPT, 2006). Approximately 100 bird species, 70 mammal species, many reptiles, and a few amphibian species occur on the various habitat types provided in the sagebrush-steppe of northeastern Nevada. In addition, approximately 70 aquatic birds species could utilize habitat provided by seasonally-flooded agricultural areas, perennial streams and associated riparian areas, wet meadows, and wetlands on a seasonal or yearlong basis that are within, or in close proximity to, the proposed project. A number of bird and mammalian species, including those that are considered as obligates to riparian or wetland habitat, also inhabit the areas on a seasonal basis. Many of the bird species are included in the "Migratory Birds by Habitat Type" list from the 1999 Nevada Partners in Flight Bird Conservation Plan, and some of the species are also designated as a BLM-Sensitive species (Section 3.1.8). Many of these species would occur as seasonal residents in the Tuscarora Facility area. Habitat in the area is suitable for mule deer, pronghorn antelope, coyotes, mountain lions, badgers, rabbits and hares, and small animals (rodents, reptiles, and amphibians). In addition to migratory birds, several resident game birds do or may inhabit the area, including greater sage-grouse and chukar partridge. A variety of raptors also use the area including golden eagles and red-tailed hawks. Table 6 provides a list of wildlife species that have the potential to occur within and or around the Tuscarora Facility area.

Table 6 Potential Wildlife Species in the Tuscarora Facility Area

Common Name	Scientific Name	Common Name	Scientific Name
Turkey vulture*	*Cathartes aura*	Horned lark*	*Eremophila alpestris*
Bald eagle	*Haliaeetus leucocephalus*	Barn swallow*	*Hirundo rustica*
Northern harrier	*Circus cyaneus*	Black-billed magpie*	*Pica pica*
Swainson's hawk	*Buteo swainsoni*	American crow	*Corvus brachyrhynchos*
Red-tailed hawk	*Buteo jamaicensis*	Common raven	*Corvus corax*
Ferruginous hawk	*Buteo regalis*	Rock wren*	*Salpinctes obsoletus*
Rough-legged hawk	*Buteo lagopus*	Mountain bluebird*	*Sialia currucoides*
Golden eagle	*Aquila chrysaetos*	American robin*	*Turdus migratorius*
American kestrel	*Falco sparverius*	Sage thrasher*	*Oreoscoptes montanus*
Merlin	*Falco columbarius*	Loggerhead shrike*	*Lanius ludovicianus*
Prairie falcon	*Falco mexicanus*	Northern shrike*	*Lanius excubitor*
Gray partridge*	*Perdix perdix*	European starling	*Sturnus vulgaris*
Chukar	*Alectoris chukar*	Brewer's sparrow*	*Pooecetes gramineus*

Common Name	Scientific Name	Common Name	Scientific Name
Sage-grouse	*Centrocercus urophasianus*	Vesper sparrow*	*Chondestes grammacus*
Mourning dove*	*Zenaida macroura*	Lark sparrow*	*Amphispiza belli*
Great Horned owl	*Bubo virginianus*	White-crowned sparrow*	*Zonotrichia leucophrys*
Burrowing owl	*Athene cunicularia*	Lapland longspur*	*Calcarius lapponicus*
Short-eared owl	*Asio flammeus*	Red-winged blackbird*	*Agelaius phoeniceus*
Common nighthawk*	*Chordeiles minor*	Western meadowlark*	*Sturnella neglecta*
Broad-tailed hummingbird*	*Selasphorus platycercus*	Brewer's blackbird*	*Euphagus cyanocephalus*
Northern flicker*	*Colaptes auratus*	Brown-headed cowbird*	*Molothrus ater*
Gray flycatcher*	*Epidonax wrightii*	Black rosy finch*	*Leucosticte atrata*
Ash-throated flycatcher*	*Myiarchus cinerascens*	Gray-crowned rosy finch*	*Leucosticte tephrocotis*
Say's phoebe*	*Sayornis saya*	House sparrow*	*Passer domesticus*
Western kingbird*	*Tyrannus verticalis*	Western skink	*Eumeces skiltonianus*
Little brown bat	*Myotis lucifugus*	Great Basin pocket mouse	*Perognathus parvus*
Long-eared myotis	*Myotis evotis*	Dark kangaroo mouse	*Microdipodops megacephalus*
Long-legged myotis	*Myotis volans*	Ord kangaroo rat	*Dipodomys ordii*
Small-footed myotis	*Myotis ciliolabrum*	Chisel-toothed kangaroo rat	*Dipodomys microps*
Silver-haired bat	*Lasionycteris noctivagan*	Deer mouse	*Peromyscus maniculatus*
Western pipistrelle	*Pipistrellus hesperus*	Northern grasshopper mouse	*Onychomys leucogaster*
Big brown bat	*Eptesicus fuscus*	Desert woodrat	*Neotoma lepida*
Townsend's big-eared bat	*Plecotus townsendii*	Sagebrush vole	*Lemmiscus curtatus*
Brazilian free-tailed bat	*Tadarida brasiliensis*	House mouse	*Mus musculus*
Black-tailed jackrabbit	*Lepus californicus*	Kit fox	*Vulpes macrotis*
Mountain cottontail	*Sylvilagus nuttal1ii*	Coyote	*Canis latrans*
Pygmy rabbit	*Sylvilagus idahoensis*	Long-tailed weasel	*Mustela frenata*
Townsend's ground squirrel	*Spermophilus townsendii*	Badger	*Taxidea taxus*
Belding ground squirrel	*Spermophilus be1dingi*	Striped skunk	*Mephitis mephitis*
Least chipmunk	*Tamias minimus*	Mountain lion	*Felix concolor*
Botta's pocket gopher	*Thomomys bottae*	Bobcat	*Lynx rufus*
Northern pocket gopher	*Thomomys talpoides*	Mule deer	*Odocoileus hemionus*
Little pocket mouse	*Perognathus longimembris*	Pronghorn	*Antilocapra americana*
Desert horned lizard	*Phrynosorna platyrhinos*	Short-horned lizard	*Phrynosorna douglassii*

Common Name	Scientific Name	Common Name	Scientific Name
Western whiptail	*Cnemidophorus tigrus*	Long-nosed snake	*Rhinocheilus lecontei*
Desert collared lizard	*Crotaphytus insularis*	Ground snake	*Sonora semiannulata*
Long-nosed leopard lizard	*Gambelia wislizenii*	Night snake	*Hypsiglena torquata*
Desert spiny lizard	*Sceloporus magister*	Gopher snake	*Pituophis melanoleucus*
Sagebrush lizard	*Sceloporus graciosus*	Racer	*Coluber constrictor*
Western fence lizard	*Sceloporus cccidentalis*	Striped whipsnake	*Masticophis taeniatus*
Side-blotched lizard	*Uta stansburiana*	Western rattlesnake	*Crotalus viridis*

Note that bird species followed by an * in Table 6 are considered a migratory bird species

Big Game

The Tuscarora Facility is located in the NDOW Big Game Management Unit 067 of Management Area 6. The area provides intermediate mule deer range (fall and spring) and a well–documented migration corridor between the Independence and Tuscarora ranges. The Marsh Creek Bench crucial winter range area to the east is located from approximately the Snow Canyon Road north to Marsh Creek on the west side of the Independence Range. As of 1999, approximately 3,800 acres of private lands owned by the Ellison Ranching Company that adjoins the Bucket Flat Allotment on the bench is under a 25-year conservation easement funded by the Mule Deer Foundation, a private conservation group. According to the NDOW's September 2006 Marsh Creek Bench Restoration Proposal, it is estimated that approximately 500 to 1,000 mule deer winter on the bench area and another 2,000 to 3,000 could potentially move through the Marsh Creek area and the Ormat Tuscarora Project area as part of intermediate range (fall and spring) on their way to and from winter range areas south to southwest of the area. As such, the overall area provides one of the highest use mule deer crucial winter range, intermediate range, and migration corridor areas within the NDOW-delineated Management Area 6. The intermediate range is primarily utilized by mule deer from October 15 thru December 14 and March 16 through May 1.

The area also provides pronghorn antelope summer range and movement corridors from the north and east. Populations of pronghorn antelope have increased substantially over the last 25 years on the Elko District. This is likely a result of natural expansions back into suitable habitat, population increases after the pre-1980s winter event(s) that resulted in high mortality, fence modifications, and a collective number of wildfires that have created more preferred "open" habitat. However, Wyoming and basin big sagebrush, low sagebrush and antelope bitterbrush provide the main shrub component needed for forage and cover, and ecological site dynamics on the affected area.

Collectively, more than 250 wildlife species could utilize suitable habitat on the affected area on a seasonal or yearlong basis. Other game and nongame wildlife species include approximately 100 bird species, 70 mammal species and several reptile and amphibian species that can be found in sagebrush habitats with many more additional species also found in the vicinity of mountain brush, and riparian and meadow habitats including areas with willow cover. Nineteen raptor species are present on the Elko District. All nineteen have the potential to utilize habitats available on the area.

Aquatic wildlife resources, including sensitive fish, amphibian, and invertebrate species within the Tuscarora Facility area are limited primarily to Harrington Creek and the upper reaches of Hot Creek prior to its confluence with water from the hot springs.

Migratory birds are found in the vicinity of the Tuscarora Facility as either seasonal residents or as migrants. All native migratory birds of the United States are protected under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703-712 et. seq.). Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, directs Federal agencies to take certain actions to further implement the Act. In 2006, DOE and USFWS signed a Memorandum of Understanding (MOU) regarding implementation of that Executive Order. (DOE, 2006) The MOU requires DOE to integrate migratory bird conservation principles, measures, and practices into DOE activities. The MOU also commits DOE to avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources. There are numerous species of migratory birds that have the potential to use habitat in the area.

3.1.7.2 Environmental Consequences

Proposed Action

Approximately 62.8 acres of wildlife habitat would be impacted by implementation of the Tuscarora Facility. Approximately 19.3 acres have been disturbed during previous exploration and development activities. The disturbance would result in the loss of habitat for individual animals including areas for foraging used by larger animals.

This disturbance would likely force existing small individual animals (small mammals and reptiles) to migrate to adjacent undisturbed areas. Assuming the adjacent areas are at carrying capacity, increased pressure on individual animals for resources would result. This may cause result in mortalities to some individual animals. Because of the small area of impact, the loss of individual animals would be minimal and would not substantially impact the overall species population of the area.

Pipelines may inhibit local migration routes for big game such as deer. The pipelines are low enough (approximately 48 inches above the ground) to allow adult deer to jump over them.

However, the 24-inch pipe suspended around 24 inches off the ground is at or near the eye sight level of mule deer, pronghorn and younger age class elk, and form a solid visual barrier for observation of terrain, obstacles, etc, on the opposite side of the pipe. If deer are unwilling to jump the pipelines, and adequate measures are not completed to allow for travel ramps over the pipe, the pipelines would force deer to travel a longer distance to bypass the pipelines. In response to NDOW's recommendations, proposed EPMs (Appendix A) include installation of two underground crossings for big game. The location and design of the crossing would be determined by NDOW in consultation with ORMAT.

Mule Deer

Mule deer avoidance of otherwise suitable habitats within 2.7-3.7 km of natural gas wells suggests substantial indirect habitat loss from energy development. (Sawyer, 2006) Changes in habitat use were immediate with no evidence of acclimation over time (3 years). Observed shifts in deer distribution as the study progressed were toward less-preferred and presumably less-suitable habitats. It is likely that mule deer would utilize portions of the northern 8,700-foot suspended injection well pipe area where topographical features on hills and ridges surrounding Hot Creek would help to conceal well areas and the generating facilities to the south.

Pronghorn

Unlike mule deer and elk, pronghorn typically habituate to humans when not hunted, but continual fracturing of previously undisturbed lands lead pronghorn to reduce their use or to abandon habitat patches <243 ha (600 ac) in size. Once density of wells reached a threshold, pronghorn no longer used gas fields irrespective other factors such as snow depth. Radio-marked pronghorn consistently avoided otherwise suitable habitats within 100 meters of a producing well at all times, including at night when human disturbance was reduced. Aerial flight data and >56,000 locations of radio-marked pronghorn indicate complete avoidance of the Jonah Gas Field, an area of intense development where >600 pronghorn spent the winter prior to drilling. (Berger, 2006)

It is likely that an undetermined number of pronghorn would habituate to the generating facilities and well locations for an undetermined distance, particularly, when humans are not present, but would avoid an area where they could not see over a "line-sight" distance across the solid barrier imposed by the suspended pipe. They would likely use ramps where they can see potential obstacles and danger on the opposite side of the pipe. Some individual or groups of pronghorn could become familiar with suspended pipeline spans and use it for shade during the heat of the summer.

Project-related disturbance would also remove approximately 62.8 acres of nesting habitat for migratory and resident bird species, of which 19 acres have already been disturbed. Disturbance

to these areas would be conducted outside of the nesting season to the extent possible. If disturbance cannot be delayed to avoid the nesting season, a biologist would conduct a nesting survey to ensure nests are identified and avoided. Areas adjacent to project facilities would be impacted during construction and reclaimed immediately following construction. This short-term disturbance amounts to approximately 16.5 acres. The long-term loss of habitat would be approximately 46.3 acres.

No impacts to aquatic species are anticipated as a result of the Tuscarora Facility. Aquatic macroinvertebrates are extremely limited downstream of the hot springs due to the temperature of the water.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to wildlife resources.

3.1.8 Threatened, Endangered, and Sensitive Species

3.1.8.1 Affected Environment

A threatened, endangered, and sensitive (TES) species record search and consultation was conducted using information from the Nevada Natural Heritage Program (NNHP) (NNHP, 2006), the United States Fish and Wildlife Service (USFWS) (USFWS, 2006), and NDOW. No species listed as threatened or endangered occur in the area. Sensitive plant, animal, and aquatic species with the potential to occur within the Tuscarora Facility area are listed in Table 7 and are further discussed below.

Table 7 Potential TES Species in the Tuscarora Facility Area

Common Name	Scientific Name	Status
Broad fleabane	*Erigeron latus*	BLM Sensitive
Least phacelia	*Phacelia minutissima*	BLM Sensitive
Lewis' buckwheat	*Eriogonum lewisii*	BLM Sensitive
Pygmy rabbit	*Brachylagus idahoensis*	BLM Sensitive
Preble's shrew	*Sorex preblei*	BLM Sensitive
Small-footed myotis	*Myotis ciliolabrum*	BLM Sensitive
Yuma myotis	Myotis yumanensis	BLM Sensitive
Long-eared myotis	*Myotis evotis*	BLM Sensitive
Long-legged myotis	*Myotis volans*	BLM Sensitive
Fringed myotis	*Myotis thysanodes*	BLM Sensitive, State Protected
Townsend's big-eared bat	*Plecotis townsendii*	BLM Sensitive, State Sensitive
Spotted bat	*Euderma maculatum*	BLM Sensitive, State Threatened
Peregrine falcon	*Falco peregrinus*	BLM Sensitive, State Endangered

Common Name	Scientific Name	Status
Golden eagle	*Aquila chrysaetos*	BLM Sensitive, State Protected
Prairie falcon	*Falco mexicanus*	BLM Sensitive, State Protected
Swainson's hawk	*Buteo swainsoni*	BLM Sensitive, State Protected
Ferruginous hawk	*Buteo regalis*	BLM Sensitive, State Protected
Burrowing owl	*Athene cunicularia*	BLM Sensitive, State Protected
Short-eared owl	*Asio flammeus*	BLM Sensitive, State Protected
Long-eared owl	*Asio otus*	BLM Sensitive, State Protected
Northern goshawk	*Accipiter gentiles*	BLM Sensitive, State Protected
Loggerhead shrike	*Lanius ludovicianus*	BLM Sensitive
Vesper sparrow	*Poocetes gramineus*	BLM Sensitive
Black rosy-finch	*Leucosticte atrata*	BLM Sensitive
Lewis's woodpecker	*Melanerpes lewis*	BLM Sensitive
Yellow-breasted chat	*Icteria virens*	BLM Sensitive
Long-billed curlew	*Numenius americanus*	BLM Sensitive
Greater sage-grouse	*Centrocercus urophasianus*	USFWS Candidate
Sandhill crane	*Grus Canadensis*	BLM Sensitive
White-faced ibis	*Plegadis chihi*	State of Nevada Protected
Interior redband trout	*Onchorhynchus mykiss gibbi*	BLM Sensitive
Columbia spotted frog (Great Basin Population)	*Rana luteiventris*	USFWS Candidate

Vegetation

Broad Fleabane

Broad fleabane occurs in Elko County and adjacent counties in Idaho and Oregon. It is known to occur in the Independence Mountains between 6,200 and 6,450 feet AMSL. Broad fleabane generally occurs on shallow, dry, and barren soils of volcanic origin. Its common associates include sagebrush species. Habitat for broad fleabane occurs in the Inter-Mountain Basins Big Sagebrush Shrubland type habitat located north of the hot springs complex. Broad fleabane was not observed during baseline surveys.

Least Phacelia

Least phacelia occurs in Nevada within Elko and Eureka counties. In Nevada, it is aquatic or wetland dependent. Least phacelia commonly occurs at the margins of corn lily (*Veratrum californicum*) patches, in quaking aspen (*Populus tremuloides*) stands, and in sagebrush swales. Limited habitat is available for least phacelia in the sagebrush and wetland habitat types in the Tuscarora Facility area. Least phacelia was not observed during surveys.

Lewis' Buckwheat

Lewis' buckwheat is endemic to Nevada and occurs in Elko and Eureka counties. It usually occurs on dry, rocky barren slopes of carbonate rock soils. Lewis' buckwheat commonly occurs with low sagebrush and bottlebrush squirreltail between 6,470 and 9,720 feet AMSL. Habitat for Lewis' buckwheat occurs in shallow soils within the Great Basin Xeric Mixed Sagebrush Shrubland type. Lewis' buckwheat was not observed during baseline surveys.

Small Mammals

Pygmy Rabbit

Pygmy rabbits are a BLM Sensitive Species that were petitioned for listing as threatened or endangered under the Endangered Species Act. As of September 29, 2010, the U.S. Fish and Wildlife Service determined that, "… pygmy rabbit does not warrant protection under the Endangered Species Act." This does not downplay the need for collective land management actions to conserve, enhance or protect pygmy rabbit habitat.

Pygmy rabbits are found in a variety of vegetation types that include big sagebrush that are suitable for creating their burrow system. Sagebrush, forbs and grasses are utilized as forage with percentages of intake variable on a seasonal basis. The presence of the perennial Hot Creek drainage system, with big sagebrush as a shrub component, increases the likelihood of pygmy rabbit occurrence on the Tuscarora Facility project area. No pygmy rabbits or active burrows were observed during baseline surveys. (USFWS, 2010)

Preble's Shrew

Although little is known of the habits of the Preble's shrew, this species is known to occur primarily in sagebrush habitats, but may also occur in montane shrub type habitat and sometimes in riparian areas. Sagebrush habitat is widely available in the area surrounding the project. No shrews were observed during baseline surveys; however, small mammal trapping was not conducted.

Bats

Small-footed Myotis

The small-footed myotis occurs in deserts, chaparral, riparian zones and forests, but is most common in pinyon-juniper habitat. Small-footed myotis often roost in caves, abandoned mine workings, or in rock fissures on cliff faces. Cliff/talus habitat in the Tuscarora Facility area is limited and available only in the highest elevations in the surrounding areas. No caves or abandoned mine workings are known to be present in or around the Tuscarora Facility area, making it unlikely small-footed myotis would inhabit the area.

Yuma Myotis

The Yuma myotis is often associated with water, including small ponds, lakes, and streams. Yuma myotis may roost in buildings, caves, trees and under bridges (Bogan et al., 1998a). Yuma myotis lack adaptations to arid environments shown by some other myotis species (Wilson and Ruff, 1999). No adequate roosting habitat is present within the Tuscarora Facility area.

Long-eared Myotis

The long-eared myotis occurs in a variety of habitats, but is most often associated with coniferous forest. This species utilizes a variety of roost locations (Bogan et al., 1998a) such as buildings, tree cavities, or under tree bark. This species association with forest habitats makes it unlikely that this species would be found in the Tuscarora Facility area.

Long-legged Myotis

The long-legged myotis usually occurs in forested habitats throughout the western United States, but may be found in drier areas, including desert habitat. The species uses a variety of roost sites during the warmer season, and hibernates in caves and underground mines (Bogen et al., 1998b). It is possible that the long-legged myotis would occur in the high, open woodlands surrounding the Tuscarora Facility area.

Fringed Myotis

The fringed myotis (*Myotis thysanodes*) occurs throughout much of the western United States in a variety of habitats. Oak and pinyon-juniper woodland seem to be favored habitats (Bradley and Ports, 1998). Fringed myotis are colonial, and may roost in caves, underground mines, buildings, under bridges and in trees. Hibernation occurs in buildings and underground mines (Bradley and Ports, 1998). According to the Revised Nevada Bat Conservation Plan (Bradley et al., 2006), the fringed myotis is considered to be at high risk in the state. Habitat for the fringed myotis is not present in the Tuscarora Facility area, thus this species likely does not occur in the area.

Townsend's Big-eared Bat

The Townsend's big-eared bat (*Corynorhinus townsendii*) is generally a cave dweller. This species often roosts in abandoned mine shafts and adits. This species is generally found in desert scrub and pinyon-juniper habitats (Jameson and Peeters, 1988). The species hibernates in cold (but above freezing), well ventilated places in caves, mine adits, and similar locations (Pierson et al., 1991; Kunz and Martin, 1982). The Revised Nevada Bat Conservation Plan indicates that Townsend's big-eared bat occurrence in Nevada is highly correlated with available cave and abandoned underground mine sites, and that the species is at high risk in Nevada (Bradley et al.,

2006). There are no caves or underground mines to provide habitat for this species, thus it is unlikely this species occurs in the Tuscarora Facility area.

Spotted Bat

The spotted bat (*Euderma maculatum*) is widespread but evidently occurs in very low numbers. The spotted bat roosts in crevices on cliffs, and has been reported from a variety of elevations and habitats, including ponderosa pine forest, desert scrub, pinyon-juniper, and open pasture (Leonard and Fenton, 1983). Most often, they are found in dry, rough desert terrain (Watkins, 1977). Spotted bat populations may be limited by the availability of suitable roosting sites. The Revised Nevada Bat Conservation Plan indicates the spotted bat is a species at moderate risk in Nevada (Bradley et al., 2006). Large cliffs are not present in the Tuscarora Facility area, thus the presence of spotted bats is unlikely.

Birds

Peregrine Falcon

The peregrine falcon was once a species found throughout the North America, but has declined over the last 60 years to very low populations. Peregrine falcons prefer to nest on cliffs or talus slopes. They feed on other birds, preferring pigeons, waterfowl, jays, crows, robins, and other small to medium birds. The lack of tall cliffs (potential peregrine falcon nesting sites) in the immediate area suggests nesting by peregrine falcons within the Tuscarora Facility area is unlikely.

Golden Eagle

Golden eagles are found throughout western North America is a variety of habitats. Their nesting and feeding requirements are much more general than bald eagles. Golden eagles would nest on cliffs, in trees, or on earthen mounds. Their diet is highly variable, but usually consists of small mammals and grouse (Terres, 1991). Golden eagle habitat is available within the Tuscarora Facility area. No golden eagles were observed during surveys nor were any nest sites observed.

Prairie Falcon

The prairie falcon is widespread throughout the arid plains, hills, and mountains of western North America. The prairie falcon forages and nests in a variety of habitats, but prefers cliffs for nesting. Abundant foraging habitat for the prairie falcon is available in the Tuscarora Facility area and surrounding areas. Nesting habitat is very limited in the Tuscarora Facility area. No prairie falcons were observed during surveys.

Swainson's Hawk

Swainson's hawks are widespread throughout North America during the spring and summer months, after which they migrate to South America for the winter. In Nevada, Swainson's hawks are usually associated with sagebrush and montane shrub habitats where they search for rodent prey. They often nest in lone big cottonwood trees in fields and sometimes on low cliffs or talus slopes. Swainson's hawks would often perch on power poles to search for prey. Habitat for the Swainson's hawk is widely available in and around the Tuscarora Facility area, however, none were observed during surveys.

Ferruginous Hawk

In pinyon-juniper habitats of the Great Basin, ferruginous hawks typically nest in juniper trees along the forest-shrubland edge. Their nests are often located on the furthest extension of trees into the adjacent shrubland habitats (Howard and Wolfe, 1976; Smith and Murphy, 1982). Ferruginous hawks prey heavily on ground squirrels. Because their principal prey (ground squirrels) enters aestivation by late July or early August, ferruginous hawks typically fledge young and leave the area by early August. Foraging habitat for ferruginous hawks is widely available in the Tuscarora Facility area. No ferruginous hawks were observed during surveys.

Western Burrowing Owl

Western burrowing owls generally inhabit open areas with low vegetation. The owls utilize underground burrows for nesting and shelter. Nesting areas characteristically include an elevated perch site or sites, such as fence posts, utility poles, or mounds of earth. Burrowing owls may be active throughout the day, with activity peaks near dawn and into the early morning, and near dusk. The burrowing owl is a migratory species in the northern portion of its range and a year-round resident in the south. This species is federally protected under the Migratory Bird Treaty Act. Ryser (1985) indicates most burrowing owls in the Great Basin are migratory. No burrowing owl nests were identified within the Tuscarora Facility area and no owls were observed during surveys.

Short-eared Owl

Short-eared owls occur on every continent except Australia. They utilize a variety of habitats, but in the western United States are often associated with marshland habitats, including irrigated agricultural lands and wetlands. Short-eared owls prey on rodents, rabbits, and grasshoppers and often hunt in the day. The short-eared owl is a ground nesting species typically in open fields or marshes. Foraging and nesting habitat for short-eared owls is widely available in the Tuscarora Facility area and surrounding areas. No short-eared owls were observed during the surveys.

Long-eared Owl

The long-eared owl is a nocturnal species, hunting almost exclusively at night over open land. They often use sagebrush and montane shrub type habitats for foraging where they feed on mice, shrews, squirrels, and young rabbits. Long-eared owls would occasionally take grouse, meadowlarks, blackbirds, warblers, and similar sized birds. In the western United States, they would usually nest in dense pine or juniper stands. Nesting habitat is available to the north of the Tuscarora Facility area in the wooded areas of the Independence Mountains. No long-eared owls were observed during the surveys.

Northern Goshawk

Northern goshawks are primarily a forest species. They would occasionally nest in pinyon pine or junipers. They are often associated with montane riparian habitats where they would nest in larger aspen or cottonwood trees. Goshawks would also utilize adjacent montane shrub or sagebrush habitats where they would forage for rabbits, hares, squirrels, and small birds, such as grouse, blackbirds, and crows. Goshawks are known to occur in the wooded areas of the Independence Mountains. Because of the lack of wooded areas, habitat for the Northern Goshawk is not available in the Tuscarora Facility area.

Loggerhead Shrike

In the Great Basin, loggerhead shrikes are typically associated with greasewood (Grant et al., 1991), and sagebrush communities (McAdoo et al., 1989). They also frequent open country in valleys and foothills, juniper or pinyon-juniper woodlands, mahogany stands, and the edges of ranches and towns. Dense stands of trees and shrubs are used for nesting and roosting sites, as well as for hunting perches (Ryser, 1985). Nests are usually built between 3 and 30 feet above the ground in a tree crotch or on top of an old nest, often in dense twigs or foliage (Fraser and Luukkonen, 1986). Shrikes hunt where tall vegetation is scattered and there is much bare ground or ground covered with short vegetation. They often hunt from telephone wires and fences (Ryser, 1985). These small predators are known to prey on rodents, insects, and even on other small birds, often impaling their victims on thorns of trees, shrubs or on barbed wire fences. Habitat is available for loggerhead shrikes in the Tuscarora Facility area, however, no loggerhead shrikes were observed during surveys.

Vesper Sparrow

Vesper sparrows live on the ground in dry fields, pastures, meadows, and sagebrush steppe habitats. Their nests are commonly found between sagebrush openings. Habitat is widely available throughout the Tuscarora Facility area and surrounding areas. Vesper sparrows were observed species during surveys.

Black Rosy-Finch

Black rosy-finches nest and spend summers in mountains, nesting in boulders and rock crevices. In summer, they move down into valleys and roost in caves, mine shafts, and barns. Black rosy-finch nesting habitat is potentially available in the higher elevations of the Independence Mountains and potential summer habitat is widely available in the areas surrounding the Tuscarora Facility area. No black rosy-finches were observed during surveys.

Lewis' Woodpecker

Lewis' woodpecker is widespread throughout the western United States. It nests in the cavities of trees, including pinyon pine and juniper and feeds aerially on insects and also eats fruits including juniper berries. Lewis' woodpecker often perches on fence posts while foraging. It is often associated with montane riparian habitats where it would nest in cottonwood trees. Limited habitat is available for Lewis' woodpecker in the Tuscarora Facility area due to the lack of large trees for nesting. No woodpeckers were observed during surveys.

Yellow-breasted Chat

The yellow-breasted chat is generally found in montane riparian habitat, often in dense forest or thickets. Montane riparian habitat exists outside the Tuscarora Facility area in the Independence Mountains and in Taylor Canyon located to the south. No yellow-breasted chats were observed during surveys.

Long-billed Curlew

Long-billed curlews nest in prairies and meadows and visit wetlands and rivers during migration. Irrigated pastures, wetlands, and open grasslands provide feeding and nesting habitat for the long-billed curlew. Suitable habitat for the long-billed curlew can be found adjacent the Tuscarora Facility area in irrigated fields. No long-billed curlews were observed during surveys.

Sandhill Crane

In northern Nevada, sandhill cranes are associated with wetlands and irrigated pastures and hay fields. They often feed in newly planted or harvested fields, marshes, or dry hillsides. Sandhill cranes would nest in irrigated pastures, wetlands, or in grasslands. Sandhill cranes are abundant in the Independence Valley in wetland areas surrounding the Tuscarora Facility area. Sandhill cranes were observed in the irrigated fields associated with Harrington Creek to the west of the proposed power plant site.

White-faced Ibis

The whiteface ibis is a wetland-dependent species. They feed on aquatic insects, crustaceans, snails, and worms and nests in bulrushes or reeds. Feeding habitat may be potentially available in the irrigated pastures within and surrounding the Tuscarora Facility area. Nesting habitat,

however, is not available in the Tuscarora Facility area. No white-faced ibis were observed during surveys of the Tuscarora Facility area.

Federally Listed, Proposed and Candidate Species (Terrestrial Species)

There are no federally listed or proposed species associated with the project area. Candidate species include the greater sage-grouse and the Columbia spotted frog (Great Basin Population), (*Rana luteiventris*).

Greater Sage-Grouse

The Ormat Tuscarora Project area is within the Tuscarora and North Fork Sage Grouse PMUs in Nevada. The Tuscarora PMU is being considered under the Governor's Nevada Sage Grouse Conservation Strategy by the Northeastern Nevada Stewardship Group as part of greater sage-grouse conservation planning efforts underway for the Elko District. (Neels, 2001) The Tuscarora PMU was designated as the PMU under the Elko Strategy with the "highest risk". This can be interpreted, in effect, that risks to populations and habitat warranted the top priority for conservation measures to improve population levels and habitat conditions. Sage grouse have been observed by State and BLM biologists in the area during the summer, spring, fall and winter.

The greater sage-grouse was designated a candidate species by the USFWS as of March 5, 2010. Candidate species are those species, which are determined to be eligible for listing as a threatened or endangered species, but due to other species having a higher priority for listing, the species is listed as a candidate species.

On March 5, 2010, the USFWS announced Proposed Rules in the Federal Register (2010 Federal Register) for the notice of 12-month findings for petitions to list the greater sage-grouse as a threatened or endangered species. The Fact Sheet for this finding iterated the following, *"After thoroughly analyzing the best scientific and commercial information available, the Fish and Wildlife Service has concluded that the greater sage-grouse warrants protection under the Endangered Species Act. However, the Service has determined that proposing the species for protection is precluded by the need to take action on other species facing more immediate and severe extinction threats. As a result, the greater sage-grouse will be added to the list of species that are candidates for Endangered Species Act protection. The Service will review the status of the greater sage-grouse annually, as we do all candidate species, to determine whether it warrants more immediate attention."* The Proposed Rules were formally announced in the Federal Register on March 23, 2010 under the following reference: 13910 Federal Register / Vol. 75, No. 55 / Tuesday, March 23, 2010 / Proposed Rules.

The area in the vicinity of the Tuscarora Facility provides intact sagebrush habitat for greater sage-grouse. Seasonal use could occur as lekking nesting, early brood-rearing, summer and

fall/winter habitat. Recent wildfires from 2000 to 2007 have negatively impacted tens of thousands of acres of greater sage-grouse habitat on the Tuscarora and Independence ranges and within Independence Valley. A high percentage of these same burn areas have been seeded with native shrub, grass, and forb species as part of wildlife habitat rehabilitation efforts with noted re-establishment of natural vegetation as well as successful artificial shrub, grass and forb seeding efforts.

Habitat for sage-grouse is present throughout the Tuscarora Facility area and sage-grouse are present in the area (Figure 10). The area on and surrounding the project provides collective areas with one of the highest documented sage grouse population densities in Nevada. These populations are associated with a high density of leks and habitat to sustain populations on a yearlong basis. Three leks are within one mile of the plant site. A total of 10 active leks are within 3 miles of the power plant and access road. The combined "high count" of male sage grouse associated with these leks was 291 males in 2008 and 352 males in 2011. The plant site is visible from one of these leks. On-ground monitoring of one of the closest leks was conducted during exploratory drilling operations to identify potential impacts from drilling noise or activity. In addition, a nesting habitat survey was conducted along Hot Creek to identify potential nesting habitat. Most of the adequate nesting habitat was identified upgradient of the main hot springs area. Hot Creek below the hot springs area is deeply incised and would not provide adequate access for the chicks to the vegetation along the stream edges. However, side drainage areas adjoining Hot Creek provide ephemeral drainage areas with Dry Meadow ecological sites and drainage areas with intermittent or perennial drainage areas provide Dry and Wet Meadow ecological sites that provide important late brood-rearing habitat.

NDOW personnel have captured and marked sage grouse with telemetry units on leks in close proximity to the Tuscarora Facility in 2011. At least one nesting hen location has been documented through these marking efforts in May 2011.

Aquatic Species

Interior Redband Trout

Interior redband trout are a native fish of the Columbia River basin. The steelhead of the Snake River basin is a variety of this trout, which migrate from the Pacific Ocean to the upper Snake River in Idaho. Redband trout prefer cool, clear water in mild gradient streams, but can tolerate a wider temperature range than most trout. They have been observed in Harrington Creek, which is east of the power plant, as it flows south into the South Fork Owyhee River and ultimately into the Snake River. Harrington Creek provides seasonally suitable spawning habitat for redband trout.

Columbia Spotted Frog

The Columbia spotted frog (*Rana luteiventris*), Great Basin Distinct Population Segment, a candidate for listing as threatened or endangered, is known to occur in streams within the Independence Mountains and Ruby Mountains. In eastern Nevada, the Columbia spotted frog occurs in clear, slow-moving or ponded surface waters with little canopy cover, in habitats that include springs, lakes, oxbows, beaver ponds, and seeps in wet meadows (Reaser, 1997). A deep silt or muck substrate may be required for hibernation and torpor (Morris and Tanner, 1969). Available habitat may be available along the northern portions of Hot Creek above the hot springs where the water is cool. No Columbia spotted frogs were observed during surveys of the Tuscarora Facility area.

3.1.8.2 Environmental Consequences

Proposed Action

Three TES species have been observed within or near the Tuscarora Facility area. Other TES species for which habitat is present but no individuals were observed include several bats species, pygmy rabbits, several raptor species, loggerhead shrike, and yellow-breasted chat. The species observed within or near the Tuscarora Facility area are listed below along with their current status:

- Vesper Sparrow – BLM Sensitive
- Sandhill Crane – BLM Sensitive
- Greater Sage-Grouse – USFWS Candidate species

Vesper Sparrow

Vesper sparrows were frequently observed in the Tuscarora Facility area. This is a BLM sensitive species. This species is not a sagebrush obligate species and can be found in a variety of habitats. Impacts to this species would primarily be the loss of approximately 62.8 acres of nesting and foraging habitat. In addition, during construction activities, the species would likely avoid the area. The loss of habitat is small compared to the habitat available within the Tuscarora Facility area, thus impacts would be minor.

Sandhill Crane

Sandhill cranes were observed along the flood plain of Harrington Creek where it feeds and possibly nests. However, the Tuscarora Facility area does not provide adequate foraging or nesting habitat for sandhill cranes, thus no impacts to this species are likely to occur.

Greater Sage Grouse

The negative impacts of energy development to sage grouse populations and sage grouse habitat has been well-documented with research on these impacts and methods to mitigate the ongoing

effects ongoing (Appendix A). Noise impacts have been addressed in ongoing research with preliminary findings documenting and addressing negative impacts, with the need for further research to further identify and reduce impacts. Vocalization is critical for communication on the lek sites to attract female grouse (this vocalization could be heard by, at least, humans for over a mile away). Vocal communication is also critical between hens and chicks and between flock-mates, and when sound is most effective in predator detection. Appendix A includes excerpts on the effects of energy development on sage grouse from Federal, State and academia personnel.

The Tuscarora Facility would have negative impacts to sage grouse seasonal use areas including lekking, nesting/early-brood-rearing (upland areas), late-brood-rearing and fall/winter habitat. A total of 62.8 acres of public and private lands with intact habitat would be directly impacted.

Relative to the Proposed Action, the Risk Factor Assessment for this PMU indicates the following effects could result from the Tuscarora Facility: A total of 10 active leks are within 3 miles of the project site, road and powerline. The plant site is visible from the Hot Springs lek. Potential impacts to sage-grouse from implementation of the Tuscarora Facility would include loss of approximately 62.8 acres of habitat, with 19.3 acres of that having already been disturbed.

A nesting habitat survey indicated that north of the hot springs was the area that provided adequate nesting habitat along Hot Creek. The Hot Creek channel is too incised below the hot springs to provide adequate nesting habitat. Taller structures at the power plant, such as the cooling tower, could be used as a perch site for predators (hawks, crows, ravens). However, the noise associated with the cooling tower and adjacent turbines would likely prevent use of these structures by birds.

Noise from the power plant has the potential to disrupt lek activity through making it difficult for female birds to hear the males. A noise model was completed to determine the approximate decibel readings at the closest lek locations. The model takes into account atmospheric conditions, topography, and structures and vegetation, which either absorb or deflect the noise. Generally, the noise levels at the receptor sites (leks) are moderate. Data currently suggest that a decibel readings of 10 dBA above ambient levels has the potential to impact lek activity. Ambient noise levels were determined by field survey. Results of the noise model are described in Section 3.1.12.2.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to TES species.

3.1.9 Wetlands and Waters of the United States

3.1.9.1 Affected Environment

Wetlands

Based on wetland delineations conducted for the Tuscarora Facility area, there is a continuous wetland along Hot Creek and in areas around the hot springs, as shown on Figure 8. (JBR, 2007a) In addition, several tributaries to Hot Creek have isolated wetlands in the drainages. The delineation identified 29.5 acres of potential jurisdictional wetlands within the approximately 1,000-acre survey area. Additional wetlands were identified along the access route and transmission line corridor. These wetlands are associated with the Harrington Creek braided channel and flood irrigation area on the Spanish Ranch.

Waters of the United States

Hot Creek is a tributary to the Owyhee River. The Owyhee River is an interstate water and can be considered a Traditional Navigable Water[6]. The presence of a connection from Hot Creek to the Owyhee River represents a tie to a Traditional Navigable Water and establishes the basis for Clean Water Act jurisdiction of wetlands and waters in the survey area. Hot Creek discharges into the South Fork of the Owyhee River approximately three miles downstream of the survey area.

In the main hot springs area, many thermal vents are seeping or flowing hot water onto the surface and discharging into Hot Creek. Most of these sources are not recorded because they do not have a defined channel. Several thermal outlets collect into a tributary and enter Hot Creek on the east side of the valley near the main geothermal area. This tributary has an average width of three feet at the Ordinary High Water Mark. South of the main geothermal area is another cluster of hot springs where the road crosses the valley near the geothermal plant. In this cluster there is a man-made berm with culverts directing flow. There is also water seeping through the berm. Several more thermal outlets collect on the east and west sides of the valley and flow into Hot Creek below the geothermal plant. The east spring of this complex is dry by the time it reaches the main drainage, but there is a connection. In the far northwest and northeast corners of the Tuscarora Facility area there are several cold springs that collect and enter Hot Creek south of the geothermal plant location. The northeast area is dry, but there is hummocking and cracked soils indicating seasonal saturation. Wetlands in these areas are shown on Figure 8.

[6] Traditional Navigable Water is defined as "all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide."

3.1.9.2 Environmental Consequences

Proposed Action

No direct impacts to wetlands or waters of the United States would occur with implementation of the Tuscarora Facility. Most pipelines associated with the fresh water wells and the injection wells would avoid wetlands and waters of the United States. In areas where geothermal fluid injection pipelines would cross Hot Creek, the pipeline would span the creek and no disturbance is planned with the wetlands along or adjacent to the creek or the creek bed.

An indirect impact that may occur would be a reduction of flow in Hot Creek as a result of dewatering the hot springs. If reduced flows were realized, it is unlikely that wetlands along Hot Creek would be impacted because complete flow would not be lost, thus the wetlands would continue to have a source of water to support aquatic vegetation. Wetlands specifically associated with hot spring flow may be impacted from reduced flow.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to wetlands or waters of the United States.

3.1.10 Cultural Resources and Native American Religious Concerns

3.1.10.1 Affected Environment

Cultural Resources

The National Historic Preservation Act of 1966 (NHPA), as amended, and the Archaeological Resources Protection Act of 1979 (ARPA) are the primary laws regulating preservation of cultural resources. Federal regulations obligate federal agencies to protect and manage cultural resource properties and prohibit the destruction of significant cultural sites and historic properties without first mitigating the adverse effect to the site.

The NHPA sets forth procedures for considering effects to historic properties and supports and encourages the preservation of prehistoric and historic resources. It directs federal agencies to consider the impacts of their actions on historic properties. Section 106 of the NHPA, as amended, requires federal agencies to take into account any action that may adversely affect historic resources eligible for listing on the National Register of Historic Places (NRHP). Regulations, codified in 36 CFR Part 800, provide criteria to determine if a site is eligible. Beyond that, the regulations define how those properties or sites are to be dealt with by federal agencies or other involved parties.

The ARPA sets a broad policy that archaeological resources are important to the nation, as well as locally and regionally, and should be protected. The purpose of the ARPA is to secure the protection of archaeological resources and sites that are on public lands and Native American

lands. The law applies to any agency that receives information that a federally assisted activity could cause irreparable harm to prehistoric, historic, or archaeological data and provides criminal penalties for prohibited activities.

Two cultural resource inventories have been completed on private lands comprising the area for geothermal plant operations, not including the transmission line. To date, 35 sites and 12 isolated finds[7] were recorded in the area for geothermal plant operations. There are additional lands within the area for geothermal plant operations, which have not been inventoried. Currently there is no expectation of impacts to those areas not inventoried and therefore, inventories may or may not occur in the future, depending on the future needs of the facility. Of these 35 sites and 12 isolated finds, 14 sites were considered eligible for listing in the NRHP. There are an additional nine sites, considered eligible for inclusion in the NRHP, that are associated with the proposed transmission line and, hence, are discussed in Section 3.2.13 below.

Native American Cultural and Religious Concerns

In accordance with the NHPA (P.L. 89-665), NEPA (P.L. 91-190), the Federal Land Policy and Management Act (FLPMA) (P.L.94-579), the American Indian Religious Freedom Act (P.L. 95-341), the Native American Graves Protection and Repatriation Act (P.L. 101-601), and Executive Order 13007, potentially affected tribes must have an opportunity to comment and consult on the proposed project. The BLM is serving as the lead Federal agency for Section 106 compliance and Tribal consultation on the three Ormat facilities that would be covered by the proposed DOE loan guarantee. DOE is working closely with BLM in this consultation process.

Native American religious and cultural resource concerns for the Jersey Valley and McGinness Hills projects have been or are being addressed by BLM in its permitting and NEPA review processes for these projects. The reader should consult the EAs for these projects that have been incorporated by reference into this document. The discussion below focuses on the Tuscarora Facility.

Tribes with known interests within the Elko BLM administrative area and plant site location are: the Te-Moak Tribe of Western Shoshone (Elko, South Fork, Wells, and Battle Mountain bands), Shoshone-Paiutes Tribe of Duck Valley of Idaho and Nevada, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Yomba Shoshone, Confederated Tribes of the Goshute and various other groups, community members, and individuals. Cultural, traditional, and spiritual sites and activities of importance to tribes include: existing antelope traps; certain mountain tops used for prayer; medicinal and edible plant gathering locations; prehistoric and historic village sites and gravesites; sites associated with creation stories; hot and cold springs; material used for basketry

[7] In Nevada, isolated finds consist of a single (1) artifact, and are categorically ineligible for the National Register of Historic Places. A site containing more than one (1) artifact is considered to be an archaeological site.

and cradle board making; locations of stone tools such as point and grinding stones; chert and obsidian quarries; hunting sites; sweat lodge locations; locations of pine nut ceremonies, traditional gathering, and camping; rocks used for offerings and medicine gathering; tribally identified Traditional Cultural Properties (TCPs); rock shelters; "rock art" locations; and water sources in general, which are considered the "life blood of the Earth and all who dwell upon it."

Initial BLM contact with interested Tribes related to the Tuscarora geothermal development began in 2002 and consultation was carried out by BLM in the course of developing the March 2008 Environmental Assessment for the T G Power LLC Hot Sulphur Springs Transmission Line. Site visits to the Tuscarora facility site with representatives from the Western Shoshone Committee and a representative from the Duckwater Shoshone Tribes took place June 24 and July 6, 2011 respectively.

In discussions between BLM and Tribal members in the course of developing the 2008 EA, it was stated by Tribal members that the Independence Valley was used as a travel corridor for trade, hunting and gathering, and seasonal use, as the winters were very harsh. Few families stayed in the area during the colder months. People who lived in the pine nut rich areas of central Nevada would travel this corridor to reach the Snake River/Bruneau River areas where salmon was abundant. Cultural resources inventories and surveys support past use of the valley by native peoples including the site of the Tuscarora Facility. Although discussions between DOE and Tribal officials have not identified specific religious or cultural sites in the Tuscarora Facility area, Tribal officials stated that springs and other water sources are generally of religious and cultural importance to Tribes. In addition, physical remains of past cultural and subsistence practices and activities are considered to be extremely important and sacred due to such artifacts having been made by the ancestors and considered the evidence of thousands of years of native subsistence. Therefore, it is likely that the sites that have been identified in the 2008 and 2010 surveys are important to them.

3.1.10.2 Environmental Consequences

Construction of the Tuscarora Facility (the geothermal plant) would be expected to adversely affect one of the 14 identified NRHP-eligible sites within the area of the geothermal plant operation since avoidance of the site would not be possible due to its location and size. The remaining sites would be avoided. The Memorandum of Agreement (MOA) between ORMAT, BLM, DOE and the SHPO, (with a forthcoming amendment to include the Corps of Engineers), contained in Appendix D, provides for a treatment plan, conducted by a cultural resources management firm, to recover archaeological data from any historic property that would be adversely impacted from the proposed geothermal plant. Currently that is expected to be one site but could increase as construction progresses, if necessary. The MOA statement of 22 historic properties is a typographic error. There are 23 sites listed in the paragraph.

Vehicles, equipment, and personnel used for power plant and transmission line construction could indirectly have negative impacts to cultural resource sites and/or on cultural or religious activities. Power plant and transmission line construction personnel working in close proximity to cultural sites could inadvertently destroy artifacts or site features and newly created access routes could be used by members of the public to access formerly inaccessible locations, making the sites susceptible to unauthorized collection, vandalism, and compaction/erosion related to recreational activities. If sites are currently used by Tribes for cultural or religious activities construction and operation of the power plant could have a detrimental effect due to noise and visual intrusions.

Measures have already been implemented in initial construction in the project area to avoid indirect effects on the cultural resource sites identified in the 2008 and 2010 surveys. These include fencing off sites on the power plant location and restricting access to them. Neither the 2008 and 2010 surveys, nor discussions with Tribes that have been carried out in the course of consultation to date have identified the current or past use of the power plant site for any cultural or religious activities.

Although the possibility of disturbing Native American gravesites within the project area is extremely low, inadvertent discovery procedures are noted in section 2.1.7.2. The Native American Graves Protection and Repatriation Act, section (3)(d)(1), states that the discovering individual must notify the land manager in writing of such a discovery. If the discovery occurs in connection with an authorized use, the activity that caused the discovery must cease and the materials protected until an authorized officer can respond to the situation.

This analysis will be updated if any new information results from continuing communication and coordination with local Native American tribes for the Tuscarora Facility. This may include more specific identification of adverse impacts and mitigation and monitoring measures to any properties of traditional or religious importance to tribes.

3.1.11 Solid and Hazardous Wastes

3.1.11.1 Affected Environment

There are no hazardous material storage facilities in the Tuscarora Facility area and no hazardous materials are known to be routinely used in the area. The transport and handling of hazardous materials in Nevada are subject to numerous federal and state laws and regulations.

3.1.11.2 Environmental Consequences

Proposed Action

During drilling activities, diesel fuel, lubricants, hydraulic fluids and drilling chemicals (drilling mud, caustic soda, barite, etc.) would be transported to, stored on, and used at the Tuscarora

Facility drill sites. Typical of most construction projects, the storage and use of these materials may result in minor, incidental spills of diesel fuel or oil to the ground during fueling of equipment, filling of fuel storage tanks, and handling lubricants. Other incidental spills could be associated with equipment failures such as ruptured hoses. The project includes the development of a hazardous material spill and disposal contingency plan, which describes the methods for cleanup and abatement of any petroleum hydrocarbon (including petroleum contaminated soils) or other hazardous material spill. The Tuscarora Facility must conform to both federal and state requirements for handling these hazardous/regulated wastes materials.

Substantial quantities of the binary working fluid, pentane, would be stored and used (though not consumed or intentionally released). Pentane is a flammable but non-toxic hydrocarbon similar to, but less volatile than propane. During major maintenance activities on the pentane side of the binary power plant units, liquid pentane would first be transferred to the pentane storage tank. The pentane would be delivered to the site through Elko, Nevada to the south or from Idaho to the north. In both cases, the material would be transported on SR 225 to the turnoff to SR 226. From SR 226, the material would be transported to the new access road to the plant site.

The risk of an accident is considered very low due to the infrequent delivery of pentane to the power plant site. Because the binary power plant operates as a closed system, pentane use is expected to be minimal. Losses of pentane would typically only occur as a result of small leaks in valves or other locations in the system. The estimated annual volume of pentane use at the plant in Phase I is 4,592 gallons per year, or the equivalent of one-half tanker truck per year. Deliveries of pentane would be based on operational requirements and logistics, often combining deliveries to Tuscarora with deliveries to McGinness Hills, Jersey Valley, or other facilities in the area. Deliveries after completion of Phase II would be approximately double the amount in Phase I, or 9,000 gallons per year. Impacts during transportation of hazardous materials are not anticipated. Pentane evaporates almost immediately upon release, thus small leaks would not impact ground surfaces. Because the lines are under pressure, a small leak in cold weather would still result in a vapor release with no impacts to the ground. A catastrophic rupture of the pentane tank would likely result in a release to the ground. These types of events are addressed in an emergency response plan developed under the Nevada CAPP, regulated by NDEP.

Although considered unlikely, it is possible that a catastrophic fire could occur on site because of such things as a welding accident, vandalism, or equipment failure. During the dry season, such a fire could spread on to adjacent rangelands initiating a wild fire. Operating in accordance with safety regulations and regular equipment maintenance and failure prevention would minimize the possibility of fire. Ground clearing around the site in accordance with state and county regulations would help to prevent any fire from spreading to adjacent rangelands. Should such

fires occur, firefighting resources, including rangeland fire crews from the Nevada Department of Forestry, BLM, and Forest Service would be charged with fighting such fires.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts resulting from the storage or handling of hazardous materials.

3.1.12 Noise

3.1.12.1 Affected Environment

Noise is measured in decibels (dB), units that measure the apparent loudness of sound. Because the human ear is more sensitive to some sound frequencies than others, sound measured by a noise meter is typically adjusted so that it approximates sounds heard by the human ear. These adjusted units of noise measurement are called "A-weighted decibels" (dBA). Because noise levels in the environment fluctuate with time, a time-averaged noise level in dBA (Leq) is often used to characterize the noise environment at a given location. Examples of common noise levels include 30 to 35 dBA (whispered conversations at 6 feet), 40 to 50 dBA (rural to suburban residential areas during daytime), 60 dBA (normal conversation at 3 feet), and 70 dBA (a vacuum cleaner at 10 feet) (Harris and Dines, 1997). Noise levels diminish (attenuate) with distance from the source of the sound. The rate at which sound attenuates with distance is affected by topography, vegetation, wind direction, air turbulence, humidity and temperature.

Noise sources in the area of the Tuscarora Facility are typical of those in rural, agricultural areas of northern Nevada. The power plant site would be approximately 2.75 miles from the nearest residence. Residences are shielded from both the power plant site and SR 226 by elevated topography. Existing noise at the power plant site is dominated by ambient sources including wind, ranch vehicles, livestock, irregular mineral exploration, and recreational uses such as all-terrain vehicles, on BLM land to the west of the site.

The primary objective of the noise modeling effort was to assess noise impacts to the greater sage-grouse, a Candidate species for listing under the Endangered Species Act. Habitat for sage grouse is present throughout the Tuscarora Facility area and sage grouse are present in the area. A total of 10 lek sites are present in the Hot Springs Complex, which includes the project site. The noise assessment criteria established by NDOW, BLM and ORMAT focused on the period from 12 am to 5 am as the time when sage grouse are most vulnerable to impacts from noise. Accordingly, 24-hour survey of ambient noise at sage grouse lek site Hot Springs 16NW was conducted from 3 pm on June 15 to 3 pm on June 16, 2011. Based on the measurement data, the average ambient noise level was computed at 25 dBA.

3.1.12.2 Environmental Consequences

Proposed Action

Operation of the Tuscarora Facility would result in an increase in noise levels in the immediate area surrounding the plant. Noise would be generated primarily by organic vapor turbines, which can generate up to 95 dBA at a distance of one meter. The closest residential receptor (residence) is over two miles east of the plant site. In addition, the plant site is shielded from the nearest receptors by topography. Assuming a sound level of 95 dBA at one meter from the turbines, the estimated sound at the nearest residential receptor of over two miles away would be 15.3 dB (Engineering Page, 2010). This level of noise is less than a normal conversation and would not likely be noticeable. Based on this information, there would be no noise-related impacts to the closest residence.

A three dimensional (3D) noise model was created based on layout drawings, dimensions, and sound power emission levels from either manufactures specification (cooling tower) or measurement data collect from similar equipment (steam turbine and generators). The power plant components used in the noise model include one (1) cooling tower, four (4) steam turbines, and two (2) generators. The noise level predictions are based on algorithms and procedures in ISO 9613-2 [8] and ISO 9613-1[9]. Atmospheric conditions under which the model was run were based on anticipated temperatures during the spring, which is when sage grouse lek activity is at its peak.

Based on the noise levels modeled for the power plant components, and the measured ambient noise levels at the site, noise levels were predicted for the 10 lek sites in the Hot Springs Complex. Noise contours were developed for an area 8 miles (west/east) by 6 miles (north/south) The predicted noise levels for those lek sites are summarized in Table 8.

The noise assessment criteria established by NDOW, BLM and ORMAT defines a noise impact to a lek site when the existing average ambient noise level between 12 am and 5 am is exceeded by 10 dBA or more. Based on those criteria, Table 8 shows that the Tuscarora Facility would have a noise impact on five of the 10 lek sites in the Hot Springs Complex. The noise contour for the predicted noise level plus ambient noise levels [dBA] is shown in Figure 11. The figure also shows, with the red contour line, the overall incremental change of predicted noise above the

[8] ISO 9613-2 (1996) "Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation" Describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

[9] ISO 9613-1 (1993) "Acoustics -- Attenuation of sound during propagation outdoors -- Part 1: Calculation of the absorption of sound by the atmosphere" Describes the analytical method of calculating the attenuation of sound as a result of atmospheric absorption for a variety of meteorological conditions."

existing ambient noise level [dBA]. All lek sites within the 10-dBA change contour are impacted by plant noise (Navcon, 2011).

Table 8 Summary of Ambient and Predicted Noise

Lek Site	Distance in Feet from Lek location to center of Power Plant	Ambient Noise Level between 12 A.M. and 5 A.M., A-Weighed Decibel	Predicted Sound Level. A-Weighed Decibel	Predicted Noise from Power Plant and Ambient Noise, A-Weighed Decibel	Overall Change in Ambient Noise versus Predicted Noise from Power Plant and Ambient Noise, A-Weighed Decibel
Harrington Ck 3 NE	12,600	25	18.7	25.9	0.9
Hot Springs	4,400	25	35.5	35.9	**10.9**
Hot Springs 16NW	3,350	25	35.7	36.1	**11.1**
Hot Springs 18	9,050	25	26.7	28.9	3.9
Hot Springs 4	5,150	25	30.4	31.5	6.5
Hot Springs 7SE	4,250	25	36.1	36.4	**11.4**
Hot Springs 7W	7,850	25	28.4	30.0	5.0
Hot Springs 8SE	1,750	25	46.1	46.1	**21.1**
Hot Springs 8 SW	2,550	25	42.4	42.5	**17.5**
Hot Springs 9	4,500	25	32.5	33.2	8.2

The EPMs summarized in section 2.1.7.4, and presented in detail in Appendix A, are intended to manage noise levels at the Tuscarora Facility over time so that noise levels will be at or below 35 dBA (ambient 25 dBA plus 10 dBA) at active leks during the lekking period (March 15 – May 15, from 1 hour before sunrise to 10 am). If noise monitoring determines that noise levels at the monitored leks is greater than 35 dBA during the period from 12 am to 5 am, and that exceedance is due to power plant site operations, rather than natural conditions such as wind or weather, one or more of several contingent conservation measures may be implemented. Those contingent measures are described in Appendix A.

No Action Alternative

Under the No Action Alternative, the DOE would not issue a loan guarantee for the Tuscarora Facility, and the facility would not be constructed. Therefore, no noise impacts would occur.

3.1.13 Visual Resources

3.1.13.1 Affected Environment

The project site is located adjacent to Hot Creek in the northern part of Independence Valley. The project site is not visible from the residences in the valley and from SR 226. A hill to the east blocks the view of the project site. The project site is visible from BLM land to the west. However, it has few roads available for access. Under BLM guidelines (BLM, 1986), BLM lands both to the west and east of the Tuscarora Facility area are identified a Class IV visual resource. Under this classification, management activities that allow major modification of the existing character of the landscape are permitted, and the level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, BLM requires that attempts be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements such as color.

3.1.13.2 Environmental Consequences

Proposed Action

The Tuscarora Facility would result in the development of several structures including pipelines, turbines and associated structures, a cooling tower, roads, and ancillary facilities. The tallest structure at the facility would be the cooling tower, which would be approximately 50 feet high. None of the structures associated with the power plant site itself would be visible from the main access road (SR 226) due to hills to the east of the power plant. The only structure that may be visible from SR 226 would be the pipeline from the fresh water wells located approximately two miles south of the power plant site. Since the pipeline is expected to be a low profile structure any visual impacts would be minimal.

Although the power plant and other facilities are on private land, the development of the power plant would meet the goals of the BLM's Class IV designation. Negligible visual impacts are anticipated.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to visual resources.

3.1.14 Land Use

3.1.14.1 Affected Environment

The Tuscarora Facility is located on private land leased from the Ellison Ranching Company. The access road and transmission line associated with the Tuscarora Facility are located on both private and public land. The primary land uses for the Tuscarora Facility area is grazing and geothermal exploration and development. The entire proposed power plant and associated wells

are on private land, thus recreation other than by ranch personnel does not occur. Some recreation activities (ATV use and hunting) may occur on BLM managed land to the west of the project site. Livestock uses this area for grazing during certain periods of the year. Geothermal exploration has been completed periodically since the early 1980s with the majority of the activity occurring from 2003 to present.

3.1.14.2 Environmental Consequences

Proposed Action

Approximately 62.8 acres of grazing land would be removed from use with the implementation of the Tuscarora Facility. Because this is a private lease area, this loss of grazing land would not impact the current operations of the ranch. Recreation use on the BLM land adjacent to the project area would not be impacted by the Tuscarora Facility. No other land uses would be impacted by the implementation of the Tuscarora Facility.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to land management and uses.

3.1.15 Socioeconomic Resources

3.1.15.1 Affected Environment

The Tuscarora Facility is in Elko County, which ranks second largest among Nevada's 17 counties with almost 11 million acres, of which about 61.7 percent is public land administered by the BLM. The closest community to the project is Tuscarora, which is approximately 11 miles south-southeast of the Tuscarora Facility. The reported permanent resident population of Tuscarora is five. There are also several full-time residents and a trailer park at Taylor Canyon, which is approximately 20 miles south of the project. The city of Elko is the county seat, and the largest community in the area with a reported population of 16,708 from 2005. The population of Elko County in 2005 was 48,818 (Census, 2007).

3.1.15.2 Environmental Consequences

Proposed Action

With implementation of the Tuscarora Facility, there would be a temporary increase in high skill construction jobs during construction of the facility. It is estimated that construction manpower would be utilized for approximately nine months during construction of the power plant and transmission line. Construction of the Tuscarora Facility would not result in a significant socioeconomic change to the area.

Operation of the proposed geothermal power plant would require approximately seven permanent additions to the current workforce. It is assumed that these permanent staff would be

based in Elko, Nevada. This employment would not result in significant socioeconomic change to the area. The tax revenue from the facility would benefit Elko County.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts to socioeconomic conditions and resources.

3.1.16 Environmental Justice

3.1.16.1 Affected Environment

Table 10 summarizes the ethnic composition of Elko County and the state of Nevada. In accordance with the EPA's Environmental Justice Guidelines (EPA, 1998), minority populations should be identified when either: 1) the minority population of the affected area exceeds 50 percent; or 2) the minority population of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. Analysis reveals that the ethnic composition of the populations of Elko County is less than 50 percent and is not meaningfully different than the state of Nevada. A second provision requires consideration of "impacts that may affect a cultural, historical, or protected resource of value to an Indian tribe or a minority population, even when the population is not concentrated in the vicinity."

Analysis of the percentage of persons below the poverty level for Elko County reveals that the incidence of poverty in Elko County is not meaningfully different than the state of Nevada. The Environmental Justice analysis includes a protection of children component to determine if the Tuscarora Facility would place an undue burden on children. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (EO, 1997) recognizes a growing body of scientific knowledge that demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because 1) children's bodily systems are not fully developed, 2) children eat, drink, and breath more in proportion to their body weight, 3) their size and weight may diminish protection from standard safety features, and 4) their behavior patterns may make them more susceptible to accidents. Based on these factors, the President directed each Federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. The President also directed each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks and safety risks (EO, 1997). Demographic data for ethnicity, age and income in Elko County and the state of Nevada are shown in Table 9.

Table 9 Ethnicity, Children, and Income

Description	Elko	Nevada
White	91.4	82.0
Black	0.9	7.7
Native Americans	5.6	1.4
Asian	0.9	5.7
Pacific Islanders	0.1	0.5
Hispanic or Latino	21.7[1]	23.5[1]
Persons under 5 years old	6.7	7.2
Persons under 18 years old	29.6	25.7
Per-Capita Income (1999)	$18,482	$21,989
Median Household Income (2004)	$52,202	$47,231
Persons Below Poverty (percent, 2004)	8.7	11.1

Source: U.S. Census Bureau, 2007

[1] People who identify their origin as Spanish, Hispanic, or Latino may be of any race. Thus, the percent Hispanic should not be added to percentages for racial categories. Non-Hispanic White persons are those who responded.

3.1.16.2 Environmental Consequences

Proposed Action

Environmental impacts occur if there is a disproportionately high and adverse health or environmental impact on minority or low-income populations. Since the project is not near any residences and in view of the population characteristics of the area there would be no potential adverse impacts to minority or low-income populations associated with this project.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts related to environmental justice.

3.1.17 Human Health and Safety

3.1.17.1 Affected Environment

One of the primary human health and safety concerns associated with the Tuscarora Facility prior to the development is the potential for accidents around the drill rigs currently conducting drilling activities on the site. There are potential hazards to workers from exposure of fuel and lubricants, geothermal fluids, steam, and high noise levels. ORMAT would comply with all federal, state, and local regulations with regard to drilling, material handling and storage, and disposal of all wastes. In addition, blowout prevention measures would be implemented to minimize the risk of blowouts. Other hazards include the open geothermal pools in the vicinity of drilling activities. These pools are near boiling and are accessible. ORMAT and all contractors would require maintaining safe distances from the open pools to prevent personnel from accidentally falling into one of the pools.

ORMAT's emergency response plans address injuries, fires, spills, well blowouts, hazardous material leaks, and drilling safety. The purpose of emergency response plans is to provide the company field personnel the instructions and guidance necessary to prevent emergencies, if possible. In the event there is an emergency, the plans would be used to by personnel to minimize both human health and safety concerns, and environmental impacts. These plans would be maintained by ORMAT on site for the duration of the project. In addition to the emergency response plans, the power plant would be permitted under the Nevada CAPP. This permit program requires approval from the State on the design, operation, and emergency plans for the facility.

Elko County developed the Elko County Multi-Jurisdictional Hazard Mitigation Plan to identify risks associated with natural disasters and hazardous materials. The main focus of this document is to identify the communities at risk; conduct a hazard analysis identifying the potential hazards; identifying the potentially vulnerable assets such as people, residential and non-residential buildings, critical facilities, and critical infrastructure; identify the capabilities of the county and associated assets to address hazard mitigation activities; and develop mitigation strategies. This plan in conjunction with the CAPP permit requirements would address emergency response if needed at the Tuscarora Facility.

3.1.17.2 Environmental Consequences

Proposed Action

The Tuscarora Facility would be using a pentane, a volatile organic compound, as the working fluid. Thus, a potential exists for an explosion during operation of the facility. Geothermal systems are carefully designed to automatically shut-off if out-of-balance conditions are experienced during operation. Because of the built-in safeguards, there is a low risk of catastrophic failure resulting in an explosion at the facility. If a catastrophic failure did occur, damage would be minimal due to the remoteness of the facility. Fatalities and injuries could affect the on-site work force (typically three employees per shift) but would not affect the general public. With a significant explosion, it is possible that a wildlfire could be ignited. Emergency procedures are in place to address this potential impact.

No Action Alternative

Because the Tuscarora Facility would not be developed under the No Action Alternative, there would be no impacts related to human health and safety.

3.2 TRANSMISSION LINE

This section describes the affected environment and environmental consequences associated with the Transmission Line. ORMAT is proposing to construct a 24.5-mile, 120 kilovolt (kV) electric

power Transmission Line in Independence Valley, approximately 70 miles north of Elko, Nevada. The Transmission Line would deliver power from the Tuscarora Facility to NV Energy's Humboldt Substation. Approximately 16 miles of the Transmission Line would be located on private land with the remaining 8.5 miles on public land administered by the BLM. The Transmission Line would be constructed within a 150-foot corridor with a total area of approximately 445 acres. Of that total, approximately 152 acres would be public lands and 293 acres would be private land. Total surface disturbance associated with the Transmission Line would be approximately 108 acres. Additional information is provided in section 2.2.

A detailed assessment of the Transmission Line and alternatives was included in the *Environmental Assessment – TG Power LLC Hot Sulphur Springs Transmission Line, Bureau of Land Management, Elko Field Office, March 2008*, which is incorporated by reference in this EA. However, since 2008 a new sage grouse lek was observed in the immediate area of the transmission line and access road, raising new concerns about sage grouse. In response to new information on the presence of sage grouse in the project area, and increasing concern by federal and state resource agencies, this section provides additional information and analysis that supplement the 2008 Transmission Line EA.

Table 10 shows the resources that were addressed in the 2008 Transmission Line EA as having the potential to be affected by the project.

Table 10 Resources Relevant to the Transmission Line

Element	Present	Affected	EA Section
Air Quality	Yes	Yes	Section 3.2.1
Water Resources	Yes	Yes	Section 3.2.2
Soils	Yes	Yes	Section 3.2.3
Vegetation	Yes	Yes	Section 3.2.4
Wetlands and Riparian Zones	Yes	Yes	Section 3.2.5
Invasive, Non-Native Species and Noxious Weeds	Yes	Yes	Section 3.2.6
Wildlife	Yes	Yes	Section 3.2.7
Migratory Birds	Yes	Yes	Section 3.2.8
Special Status Species	Yes	Yes	Section 3.2.9
Range Resources	Yes	Yes	Section 3.2.10
Land Use and Access	Yes	Yes	Section 3.2.11
Visual Resources	Yes	Yes	Section 3.2.12

Element	Present	Affected	EA Section
Cultural Resources	Yes	Yes	Section 3.2.13
Native American Religious Concerns	Yes	Yes	Section 3.2.14
Socio-Economics	Yes	Yes	Section 3.2.15
Areas of Critical Environmental Concern	No	No	None within the project area.
Environmental Justice	No	No	No disproportionate effects to a minority or low-income populations identified.
Floodplains	No	No	None within the project area.
Prime or Unique Farmlands	No	No	None within the project area.
Wastes, Hazardous or Solid	No	No	See discussion below.
Wild & Scenic Rivers	No	No	None within the project area.
Wilderness	No	No	None within the project area.
Forestry	No	No	None present in the project area.
Wild Horses and Burros	No	No	None present in the project area.

Based on the information in Tables 10, the following resources were assessed in the Transmission Line EA and are summarized in the following section of this EA.

- Air Quality
- Water Resources
- Soil Resources
- Vegetation
- Wetlands and Riparian Zones
- Noxious Weeds and Invasive, Non-Native Species
- Wildlife
- Migratory Birds
- Special Status Species
- Range Resources
- Land Use and Access
- Visual Resources
- Cultural Resources
- Native American Religious Concerns
- Social and Economic Concerns

3.2.1 Air Quality

Affected Environment

Generally, air quality in the Transmission Line area is good. The Transmission Line area is located in an unclassified area, and thus is considered to be in attainment for all criteria air pollutants. The Transmission Line area is also within a designated Prevention of Significant Deterioration Class II area, which allows for moderate incremental increases in emission concentrations as long as the concentrations do not exceed standards set by the State of Nevada and the Environmental Protection Agency.

Environmental Consequences

Surface disturbance related to construction would result in a short-term increase in particulate emissions from generation of fugitive dust. Dust would also be generated by traffic on roads. Environmental protection measures incorporated into the Transmission Line include measures to minimize and control fugitive emissions. A Surface Area Disturbance permit application would be submitted to the NDEP for surface disturbance associated with the Transmission Line. The permit application would include a dust control plan. Fugitive dust emissions are expected to be minimal with implementation of the environmental protection measures. Additional information on exiting air quality and potential environmental consequences is contained in section 3.3.1 of the Transmission Line EA.

3.2.2 Water Resources

Affected Environment

The Transmission Line crosses several tributaries of the South Fork Owyhee River including Harrington Creek, Niagara Creek, Thomas Jose Canyon, and Water Pipe Canyon, Snow Canyon, Bull Creek, Badger Creek, and Starvation Canyon. Harrington Creek carries runoff from mountains in the north end of Independence Valley to the more open irrigated pastures and hay meadows around Spanish Ranch. Meadows and riparian/wetland areas are associated with the creeks and several unnamed drainages and springs in the Independence Valley and mountains. The South Fork Owyhee River flows north into the Owyhee River and eventually into the Snake River.

The South Fork Owyhee River is listed in the Nevada Section 303(d) List of Impaired Waters. The South Fork Owyhee River is on the list for temperature impairment and is a Total Maximum Daily Load priority 3 waterbody. Priority 3 is the lowest Total Maximum Daily Load priority, with a timeline for developing a TMDL beyond five years.

Environmental Consequences

Construction of the Transmission Line and power plant access road would cross Harrington Creek, thus requiring installation culverts in the stream channel. This would result in a short-term increase in sediments in the stream. The portion of the new road that would be constructed in waterways will require permits from the U.S. Army Corps of Engineers and the NDEP Bureau

of Water Pollution Control. The new road would alter the pattern of historical surface water flows, including modifications to pasture lands. Culverts could restrict flow and result in localized flooding, especially during high runoff events. The increase in velocities through culverts could cause erosion and channeling on the downstream side of the culverts. With review of designs and implementation of BMPs required by the permits and other environmental protection measures, sediment loading to Harrington Creek and channelization would be minimized. Minor, if any, increases in sediment are expected to the other streams because no additional stream crossings would be constructed. The Transmission Line would not affect groundwater. Additional information on exiting water resources and potential environmental consequences is contained in section 3.3.2 of the Transmission Line EA.

3.2.3 Soil Resources

Affected Environment

The Soil Survey of Northwest Elko County, Nevada (NRCS, 2010), identified seven soil types along the Transmission Line route. These are the Donna-Stampede association (Donna), the Gochea series, the Upville-Kleckner association (Upville), the Crooked Creek series, the Chen-Cotant-Graley association (Chen), the Cotant-Quartz-Nine Mile association (Cotant), and the Sumine series. Low lying areas along the Transmission Line route, with slopes ranging from 0 to 15 degrees, contain soils from the Donna, the Upville, and the Gochea series. Soils belonging to the Crooked Creek series are with streams leading to and including the South Fork of the Owyhee River. The Chen and the Cotant associations consist of shallow well-drained residuum and colluvium derived from volcanic rocks, chert, and sedimentary rocks. Soils in the Sumine series are encountered at higher elevations along the Transmission Line route in the southern flanks of the Independence Mountains.

Environmental Consequences

The Transmission Line would result in disturbance of approximately 108 acres to existing soils as a result of clearing and construction activities at each Transmission Line pole location and the planned access road. Most of the disturbance to soils would be to the top one-foot during clearing of vegetation. Disturbance to the lower horizons of soil would typically occur as a result of drilling holes for the Transmission Line poles. The removal or disturbance of soil would result in a permanent modification to the soil structure. Due to clearing of vegetation, erosion of soils may occur at Transmission Line locations. Implementation of environmental protection measures would minimize loss of soil from erosion due to wind and water. Additional information on existing soil resources and potential environmental consequences is contained in section 3.3.3 of the Transmission Line EA.

3.2.4 Vegetation

Affected Environment

Sagebrush steppe communities dominate the Transmission Line area. The higher elevations of the Transmission Line area consist primarily of the low sagebrush, while the lower elevations exhibit big sagebrush. Lands along the Transmission Line route in Independence Valley are generally used for domestic cattle grazing and feed crop production. Feed crop areas are artificially flooded with runoff water from mountain streams during the spring and early summer periods. When combined with naturally flooded areas, where water is not diverted for irrigation, there are areas surrounding the Transmission Line that are inundated with water during the spring and early summer. Vegetation in underdeveloped areas in the valley is predominately sagebrush steppe community. Rangeland utilized for domestic cattle and mineral exploration and development were affected by wildland fires in 2006. Existing vegetation in these areas is sparse due to removal of brush following wildfire. Dominant life forms are herbaceous species. (NRCS, 2007) Vegetation along approximately 6.4 miles of the Transmission Line route was burned in the 2006 wildfires.

Environmental Consequences

Effects of the Transmission Line would be restricted to the footprint of structures, constructed access road from the Tuscarora Facility to SR 226, and areas containing the maintenance access road. Approximately 108 acres of vegetation would be removed during construction. Of the 108 acres of disturbance, approximately 19 acres would occur in cultivated areas (hay or other feed crop), on private land in Independence Valley. The remaining disturbance acreage would occur in low sagebrush, big sagebrush community, and burned areas that were dominated by sagebrush. Approximately 1 acre of disturbance would occur next to the riparian community of Water Pipe Canyon. Environmental protection measures for vegetation include the reseeding of disturbance associated with construction activities. No long-term effects, other than a minimal loss of vegetation at each pole location and for the access road, are anticipated. Additional information on exiting vegetation and potential environmental consequences is contained in section 3.3.4 of the Transmission Line EA.

3.2.5 Wetlands and Riparian Zones

Affected Environment

In the northern portion of the valley, riparian zones are present in the meadow along Harrington Creek where it flows south on Ellison Ranching Company property (Figure 8). Other riparian areas include Niagara Creek, Thomas Jose Canyon, and Water Pipe Canyon. Flows in Niagara Creek, Thomas Jose Canyon, and Water Pipe Canyon are perennial.

The Transmission Line would pass through several spring flooded/cultivated areas that are flooded when the Ellison Ranching Company and Wright Ranching divert Harrington Creek and other creeks on the Independence Range to provide flood irrigation for ranch pasturelands.

Overall, thousands of acres surrounding the project area are subject to flooding, particularly during years with average to above average precipitation.

Environmental Consequences

The Transmission Line would avoid impacts to wetlands by adjusting the pole locations to span any affected wetlands. Direct impacts to riparian zones from construction and use of the access road would include removal of riparian vegetation and alterations to the Harrington Creek channel by placement of culverts. Approximately 0.04 acres of riparian habitat would be permanently impacted by construction of the access road. ORMAT will obtain permits from the U.S. Army Corps of Engineers and NDEP for installation of the culverts, and will install erosion and sedimentation controls to reduce effects to the riparian zone and water quality.

Culverts would be placed in Harrington Creek at the access road crossing to maintain unimpeded flow of surface runoff. The road and culverts could restrict flow and cause occasional localized flooding. Increased velocity through the culvert could result in erosion and channeling on the downstream side of the culverts.

The Transmission Line would span Niagara Creek, Thomas Jose Canyon, Water Pipe Canyon, other unnamed ephemeral and intermittent drainages and springs with associated meadow or riparian/wetland complexes. Therefore, no direct effects are anticipated in these riparian zones. Additional information on wetlands and riparian zones and potential environmental consequences is contained in section 3.3.5 of the Transmission Line EA.

3.2.6 Noxious Weeds and Invasive, Non-Native Species

Affected Environment

Under Executive Order 13112, land management agencies must prevent introduction of noxious weeds and invasive non-native species and control their impact. (EO, 1999) Nevada Revised Statute 555.005 defines noxious weeds as plants that are likely to be "detrimental or destructive and difficult to control or eradicate." Vegetation surveys conducted along the Transmission Line route documented occurrences of two non-native species: hoary cress (*Carderia draba*) and cheatgrass (*Bromus tectorum*). Common fiddleneck (*Amsinckia micrantha*) was observed throughout the Transmission Line area. No other noxious or invasive non-native species were observed during the pedestrian survey. (UNCE, 2008)

Environmental Consequences

The Transmission Line would create approximately 43 acres of disturbance on public lands and approximately 64 acres of disturbance on private lands. Vegetation removal and soil disturbance during construction of the Transmission Line would expose areas for establishment of noxious weeds and invasive non-native species. Vehicles used for regular maintenance of the Transmission Line could also increase the spread of weeds and non-native species along the Transmission Line corridor. ORMAT has incorporated measures in the Transmission Line to

control and monitor noxious weeds. These measures would be employed throughout the life of the project to ensure establishment of desirable species in disturbed areas. Additional information on noxious weeds and invasive, non-native species and potential environmental consequences is contained in section 3.3.6 of the Transmission Line EA.

3.2.7 Wildlife

Affected Environment

The project lies within the Columbia Plateau ecoregion and is comprised primarily of sagebrush habitat. Sagebrush has been identified by the NDOW Wildlife Action Plan as a key habitat for wildlife conservation. (WAPT, 2006) Approximately 100 bird species, 70 mammal species, and many reptile and a few amphibian species occur on the various habitat types provided in the sagebrush-steppe of northeastern Nevada. In addition, approximately 70 aquatic birds species could utilize habitat provided by seasonally-flooded agricultural areas, perennial streams and associated riparian areas, wet meadows, and wetlands on a seasonal or yearlong basis that are directly within, or in close proximity to, the Transmission Line.

A number of passerine bird and mammalian species, including those that are considered as obligates to riparian or wetland habitats, also inhabit the areas on a seasonal basis. Habitat in the area is suitable for mule deer, pronghorn antelope, coyotes, mountain lions, badgers, rabbits and hares, and small animals (rodents, reptiles, and amphibians). In addition to migratory birds, several resident game birds do or may inhabit the Transmission Line area, including greater sage grouse, Hungarian partridge, and chukar partridge. A variety of raptors also use the area including golden eagles and red-tailed hawks.

Big game mammal species in the Transmission Line area include mule deer, pronghorn antelope, Rocky Mountain elk and mountain lions. The Transmission Line is located in the NDOW Big Game Management Units 062 and 067. Within the Transmission Line area is a mule deer migration corridor, and parts of the Transmission Line area have been designated as crucial winter habitat for mule deer. Pronghorn antelope would also be likely to use migration corridors in the vicinity of the Transmission Line area.

Aquatic wildlife (sensitive fish, amphibian and invertebrate species) within the Transmission Line area are limited primarily along Harrington Creek, as the major perennial drainage. Other perennial aquatic and riparian areas include Thomas Jose Canyon, Niagara Creek, and Water Pipe Canyon. The riparian areas associated with these streams are very important wildlife habitat and many of the bird species observed during the wildlife survey occurred within these areas.

Environmental Consequences

The Transmission Line would create approximately 108 acres of surface disturbance, 43 acres of which are on public land. Disturbance on public land would be primarily to the sagebrush-steppe

habitat. Wildlife displaced as a result of project disturbance would likely relocate to adjacent habitat. Loss of habitat resulting from project activities would be relatively small and restricted to power pole footprints. Disturbance associated with constructing the Transmission Line, such as roads and human presence, would be temporary and wildlife habitat would be restored following reclamation of these areas.

Effects of the Transmission Line on the mule deer migration corridor in the Transmission Line vicinity would result primarily from noise and human presence during construction. This activity would be phased and temporary. Furthermore, much of the construction activity would take place when deer are not migrating. Once constructed, the Transmission Line would pose no significant obstruction, either physical or from noise and activity, to deer migration. Other effects on mule deer migration, such as increased human access and vehicle collisions, are not anticipated to result from the Transmission Line.

In addition, the transmission line represents a perch site for raptors and/or ravens, and there is evidence to suggest that tall structures have the potential to reduce or eliminate activity at lek sites. Anti-perching devices would be installed to minimize the potential for raptors or ravens to perch, but the structures may result in less activity at the lek. Conservation measures may be implemented if impacts are observed, as summarized in Section 2.1.7.4 and described in Appendix A.

Due to the relatively small area of habitat disturbance, the temporary and phased nature of construction, the abundance of habitat in the immediate area, and the protection measures built into the Transmission Line, impact to terrestrial wildlife species resulting from the Transmission Line is expected to be minimal.

The new access road across Harrington Creek could affect the hydraulic function of the creek, and irrigation ditches above and below the road and culvert could affect the variety of migratory birds (next section) and sensitive terrestrial and aquatic species. Additional information on exiting wildlife and potential environmental consequences is contained in section 3.3.7 of the Transmission Line EA.

3.2.8 Migratory Birds

Affected Environment

Migratory birds are found in the vicinity of the Transmission Line as either seasonal residents or as migrants. There are numerous species of migratory birds that have the potential to use habitat in area. A list of species of concern that are a priority for management and are associated with habitat types in the area is contained in section 3.3.8 of the Transmission Line EA. The list contains species designated as "BLM-Sensitive", and species that were observed during the pedestrian survey of the Transmission Line route.

Environmental Consequences

Construction of the Transmission Line and access road could potentially affect nesting birds, depending on the time of year that construction occurs. ORMAT has incorporated measures in the Transmission Line to address potential impacts to migratory birds. They include limiting, to the extent possible, construction of the Transmission Line and access road to times outside of the nesting period. When construction has to occur within the nesting period, a qualified biologist would conduct a nesting bird survey in areas of planned disturbance. For areas with identified nests, a buffer zone would be established around these areas until the young birds have fledged. This limitation would apply to construction of the road and Transmission Line on the private land across Harrington Creek as well as in upland areas.

Predatory bird perching and nesting deterrent devices are also included as part of the Transmission Line. Raven populations have increased dramatically in recent times throughout the West. Transmission and power lines provide perching and nesting structures where previously absent or limited, which favors territory-based expansion and increase of predatory bird populations. Ravens are very aggressive predators and will readily prey on eggs or young birds in bird nests. Small mammals and the young of larger mammals are also susceptible to predatory bird predation. Anti-perching devices would be placed on power poles, where appropriate to reduce or eliminate predatory bird perching on migratory and game birds.

There is a potential for bird collisions with the Transmission Line. Behavioral factors such as, hurried flight away from predators or aerial courtship displays could distract birds from the presence of the line and increase the risk for collisions. Flight diverters would be placed on the top wire in order to reduce this potential in drainages and other appropriate areas. These devices include plastic coils and swinging metal roundels (medallions) permanently attached to the wire to allow birds to see the outline of the line during flight and modify their flight altitude to avoid potential collisions. Additional information on migratory birds and potential environmental consequences is contained in section 3.3.8 of the Transmission Line EA.

3.2.9 Special Status Species

Affected Environment

A survey of the Transmission Line corridor was conducted in 2007. In addition, information on threatened, endangered, sensitive, and candidate species was obtained from the NNHP, USFWS, and NDOW. The Transmission Line traverses several habitat types used or occupied by the species designated as sensitive by Nevada BLM. Habitat types in the project area include sagebrush, montane shrub, cliffs and talus, and limited montane riparian habitats. No species listed as threatened or endangered occur in the area. A list of sensitive plant, animal and aquatic species of concern having the potential to occur within the Transmission Line area is contained in section 3.3.9 of the Transmission Line EA.

The area in the vicinity of the Tuscarora Facility provides intact sagebrush habitat for greater sage-grouse. Sage grouse would also avoid an approximate 600-meter distance from transmission line structures. (Braun. 1998) Seasonal use could occur as lekking nesting, early brood-rearing, summer and fall/winter habitat. Recent wildfires from 2000 to 2007 have negatively impacted tens of thousands of acres of greater sage-grouse habitat on the Tuscarora and Independence ranges and within Independence Valley. As part of wildlife habitat rehabilitation efforts, much of these same burn areas have been seeded with native shrub, grass, and forb species .

Environmental Consequences

The 108 acres of vegetation and wildlife habitat disturbed by Transmission Line construction includes approximately 42 acres of big sage community that provides suitable habitat for pygmy rabbits and sage grouse, and 12 acres of low sage community that provides habitat for Lewis' buckwheat. Known locations of sensitive plant species would be avoided during construction and operation of the Transmission Line.

The Transmission Line could have negative impacts to sage grouse seasonal use areas including lekking, nesting/early-brood-rearing (upland areas), late-brood-rearing and fall/winter habitat. However, due to the abundance of habitat in the vicinity of the Transmission Line and the minimal amount of habitat loss, adverse effects are expected to be limited and would not measurably affect sage grouse populations. Environmental protection measures proposed in Appendix A would minimize or eliminate impacts to sage grouse.

The potential for habitat degradation is expected to be minimized through appropriate design as part of the permitting process, and implementation of BMPs required by the construction permits and other EPMs. Additional information on special status species and potential environmental consequences is contained in section 3.3.9 of the Transmission Line EA.

3.2.10 Rangeland Resources

Affected Environment

The majority of land along the Transmission Line route is private land used for ranching, grazing, and feed crop production. The affected ranchers have approved the Transmission Line location and are in the process of being presented easement agreements with TG Power for use of that land. Approximately 30 percent of the Transmission Line corridor is public land managed by the BLM that is used for grazing. There are three grazing allotments that in the area: Spanish Ranch, Taylor Canyon, and Eagle Rock.

Environmental Consequences

The 108 acres of construction-related disturbance would not result in a reduction of the permitted use in affected grazing allotments. In addition, the disturbance on private land would have

insignificant impacts to hay or other crop production, or grazing during the life of the Transmission Line. There would be a short-term loss of productive rangeland and cultivated habitat in disturbed areas. Long-term loss of productive grazing or cropland would be approximately 14 acres associated with the access road, and approximately 9 acres associated with pole locations after reseeding of disturbed areas. Additional information on rangeland resources and potential environmental consequences is contained in section 3.3.10 of the Transmission Line EA.

3.2.11 Land Use and Access

Affected Environment

The Transmission Line area is located in Elko County and consists of public lands administered by the BLM and private land owned by the Ellison Ranching Company, Van Norman Quarter Horses, and the Wright Ranches. The Transmission Line is accessed via SR 225 north from Elko, then west on SR 226. From SR 226, the Transmission Line would be accessed in several locations by existing dirt and gravel roads. The Transmission Line would cross SR 226 at one location.

Major land uses in the area are irrigated cropland, pastureland, rangeland, wildlife habitat, mineral exploration, and dispersed recreation such as off-highway vehicle use, hunting, and camping. There are no BLM wilderness study areas, herd management areas, Christmas tree harvest areas, or fuel and post-harvest areas within the Transmission Line area. A review of the master title plats for the Transmission Line area indicated that there are two power line corridors, a telephone line corridor, and several fences. Two short pipelines also appear on the master title plats between water trough locations.

Environmental Consequences

The Transmission Line would add an additional Transmission Line ROW, a gravel road, and a two-track road to the land uses in the area. Over time, the two-track road could result in additional disturbance as additional roads are created by recreational vehicle users when the original road is impassable. These activities would not interfere with other land uses or prevent existing access to public lands within the Transmission Line area. Additional information on land use and access and potential environmental consequences is contained in section 3.311 of the Transmission Line EA.

3.2.12 Visual Resources

Affected Environment

The Transmission Line would be located within two Visual Resource Management (VRM) classes. Approximately one mile of the Transmission Line on public land is designated as VRM Class IV. All other public land transected by the Transmission Line is designated at VRM Class III. Definitions for these VRM classes are provided in BLM Manual 8431 *Visual Resource Contrast Rating*. (BLM, 1986)

Existing structures in the area include three NV Energy transmission/distribution lines that parallel a portion of SR 226 east of Taylor Canyon. A 13 kV power distribution line extends west from the Humboldt Substation, through Taylor Canyon, and north through Independence Valley, running parallel to SR 226. This line supplies power to Taylor Canyon, Tuscarora, and nearby ranches. All of the power poles used on these lines are predominately single pole wood structures with cross arms. NV Energy also has 345 kV Transmission Lines mounted on large metal towers in the vicinity of the southern end of the Transmission Line. The 345 kV lines run west-southwest from the Humboldt Substation and cross SR 226 west of the substation, and then continues east-northeast of the Humboldt Substation into Idaho.

Other existing visual features include surface disturbances from exploration activities, such as drill pads and exploration roads, in the southern Independence Mountains. Wildland fires in recent years have also burned much of the vegetation in portions of the Independence Range and Independence Valley within the project analysis area, which have temporarily affected visual quality.

Environmental Consequences

Construction of the Transmission Line would add a line of repeating vertical structures to the landscape. This line of man-made structures would be most visible along SR 226 east and north of the Taylor Canyon area, where it would parallel existing Transmission Lines and a portion of SR 226. In addition to the contrast of these structures with the existing rural landscape, the Transmission Line would create small changes in color contrast at each pole location resulting from the removal of vegetation. These color changes would be minimal, as the disturbance at each pole location is anticipated to be 0.2 acres. Following seeding of disturbed areas, this visual color contrast would be eliminated.

Modifications to the landscape anticipated from the Transmission Line are consistent with BLM management objectives for both Class III and Class IV VRM, which allow for a moderate to strong degree of contrast. A moderate degree of contrast allows for the element to begin to attract attention and dominate the characteristic landscape while an element of strong degree of contrast demands attention and dominates the landscape and would not be overlooked. The Transmission Line would only add a moderate degree of contrast to the viewshed. Additional information on visual resources and potential environmental consequences is contained in section 3.3.12 of the Transmission Line EA.

3.2.13 Cultural Resources

Affected Environment

A Class III cultural resources inventory was conducted for the Transmission Line project area in 2007. As of the date the 2008 EA was completed, eighteen (18) archaeological sites and five isolated artifacts were recorded within the Transmission Line corridor, including one site that had been previously determined to qualify for listing on the National Register of Historic Places.

An additional seven sites were recommended as eligible for listing. Subsequently, those sites plus one more were determined to be eligible for listing, increasing the number of sites determined to qualify for listing on the NRHP, within the area of the transmission line, to a total of nine. Together with the 14 sites within the geothermal plant area, the total number of eligible sites within the Area of Potential Effect is 23 as listed in the MOA, although the MOA incorrectly states the total is 22.

Environmental Consequences

The Transmission Line could impact cultural resources directly as the result of damage incurred by construction activities, and by the introduction of elements out of character with the setting, feeling and association of historic properties eligible under National Register criteria. Indirect effects could result from improved access to areas currently with restricted public access. Creation of new or improved access could have substantial and long lasting adverse effects if cultural resources are present including both intentional and incidental deterioration of nearby cultural resources, and increased risk of vandalism and/or illegal collection. With the advent of widespread all-terrain vehicle use in recent decades, increased damage to resources beyond new access roads may be more likely.

No information is currently available concerning historic resources where viewshed may be a concern. Options for mitigating effects to setting, feeling and association are limited other than totally rerouting the project. Adjusting pole spacing and selecting pole types that are least visually impacting can lessen impacts. Viewshed issues may be relatively limited for the current project given that the new line would parallel an existing line along much of the project route. Indirect impacts to cultural resources resulting from increased human activity would be reduced or eliminated by limiting public use of the new Transmission Line/power plant access road.

The Memorandum of Agreement (MOA) between ORMAT, BLM, DOE and the SHPO, (with a forthcoming amendment to include the Corps of Engineers), contained in Appendix D, provides for a treatment plan, conducted by a cultural resources management firm, to recover archaeological data from any historic property that would be adversely impacted from the transmission line. Currently that is expected to be three sites along the access road route between the geothermal power plant and State highway 225, but could increase as construction progresses and impacts are assessed.

3.2.14 Native American Concerns

Affected Environment

Located within the traditional territory of the Western Shoshone, the BLM Elko District administrative boundary contains spiritual/traditional/cultural resources, sites, and social practices that aid in maintaining and strengthening social, cultural, and spiritual integrity. Recognized tribes with known interests within the Elko BLM administrative boundary are: the

Te-Moak Tribe of Western Shoshone (Elko, South Fork, Wells, and Battle Mountain bands), Duck Valley Shoshone-Paiutes Tribe of Duck Valley Tribes of Idaho and Nevada, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Yomba Shoshone, Ibapah Goshute, and various other groups, community members, and individuals.

Cultural, traditional, and spiritual sites and activities of importance to tribes include, but are not limited to: existing antelope traps; certain mountain tops used for prayer; medicinal and edible plant gathering locations; prehistoric and historic village sites and gravesites; sites associated with creation stories; hot and cold springs; material used for basketry and cradle board making; locations of stone tools such as points and grinding stones; chert and obsidian quarries; hunting sites; sweat lodge locations; locations of pine nut ceremonies, traditional gathering, and camping; rocks used for offerings and medicine gathering; tribally identified Traditional Cultural Properties (TCPs); TCPs found eligible to the National Register of Historic Places; rock shelters; "rock art" locations; lands or resources that are near, within, or bordering current reservation boundaries, actions that conflict with tribal land acquisition efforts; and water sources in general, which are considered the "life blood of the Earth and all who dwell upon it."

Tribal consultation is required when a federal agency undertaking may affect historic properties that are either (1) located on tribal lands, or (2) when any Indian tribe attaches religious or cultural significance to the historic property, regardless of the property's location. Through informal discussions between BLM and Tribal members, it was learned that the Independence Valley was used as a travel corridor for trade, hunting and gathering, and seasonal use, as the winters were very harsh. Few families stayed in the area during the colder months. Those people who lived in the pine nut rich areas of central Nevada would travel this corridor to reach the Snake River/Bruneau River areas, where salmon was abundant. Cultural resources inventory and survey (archaeological sites and artifacts) appear to support past use of the valley by native peoples. Most discussions focused on the major hot springs of northern Independence Valley, located on private land where both the Tuscarora Facility and Transmission Line are proposed for construction.

Environmental Consequences

In general, vehicles, equipment, and personnel used for Transmission Line construction can have negative impacts to areas utilized by native peoples and those associated artifacts. Long- and short-term noise and visual impacts can have a detrimental impact to existing cultural/traditional/spiritual activities that may occur in certain areas. Sacred sites such as mountain top prayer locations, sweat lodge locations, and hot water sources, along with edible/medicinal plant gathering sites and activities, must remain quiet and undisturbed.

Transmission Line construction and personnel working in close proximity to cultural sites could destroy artifacts, thus eliminating not only the physical evidence of native occupation, but also archaeological data, which can produce a better understanding of past and present cultures.

Newly created access routes often experience use by members of the public to access formerly inaccessible locations. If members of the general public increasingly utilize newly created access and maintenance roads and two-tracks, the cultural, traditional and/or spiritual integrity of any adjacent Native use site may be compromised.

ORMAT has agreed to measures to avoid adverse impacts to inventoried sites. Where physical avoidance is an issue for any National Register eligible and/or traditional cultural properties within or in close proximity to the Transmission Line actions, a protective "buffer zone" would be established. Wherever facility construction and operation activities are located within an area deemed culturally or spiritually sensitive, ORMAT would be responsible for educating workers on the importance of Native American historic and pre-historic physical remains (artifacts). During the project activities, if any cultural properties, items, or artifacts (stone tools, projectile points, etc.) are encountered, such items are not to be collected.

Also, though the possibility of disturbing Native American gravesites within most project areas is extremely low, procedures for inadvertent discovery will be initiated in compliance with the Native American Graves Protection and Repatriation Act. Additional information on Native American concerns and potential environmental consequences is contained in section 3.3.14 of the Transmission Line EA. Also, because the Tuscarora Facility and the Transmission Line project areas have been jointly surveyed for Native American Concerns in the past, the reader should refer to section 3.1.10 for additional detail on resource conditions and potential environmental consequences.

3.2.15 Social and Economic Concerns

Affected Environment

The project area is in Elko County, which ranks second largest among Nevada's 17 counties with almost 11 million acres, of which about 61.7 percent is public land administered by BLM. Approximately 70 percent of the Transmission Line area is privately owned and used for irrigated cropland, pastureland, and open rangeland. The remaining land within the Transmission Line area is public land that is managed for grazing, mining and other multiple uses. The closest community along the Transmission Line route is Tuscarora. The reported permanent resident population of Tuscarora is five. There are also several full-time residents and a trailer park at Taylor Canyon. Elko, Nevada is the county seat, and the largest community in the area with a reported population of 16,708. The population of Elko County in 2005 was 47,586. (Census, 2007)

Environmental Consequences

Completion of the geothermal power plant and 120 kV electric power Transmission Line would stimulate non-mining related economic growth in Elko County by increasing long-term, high paying employment opportunities, adding to the tax base, and increasing revenues. Construction of the Transmission Line would employ 15 to 25 workers for approximately five to seven

months. The workers would likely be housed in Elko, or at trailer parks located in Taylor Canyon and Lone Mountain Station (Junction of SR 225 and SR 226). This temporary influx of workers would not have a negative impact to local services but would provide a temporary income to the local establishments for services provided (trailer space rental, restaurant, groceries, etc.). Additional information on social and economic concerns and potential environmental consequences is contained in section 3.3.15 of the Transmission Line EA.

4.0 CUMULATIVE EFFECTS

This chapter analyzes the potential cumulative effects of the Proposed Action when combined with past, present, and reasonably foreseeable future projects. Cumulative effects are defined as " . . . the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR 1508.7) Cumulative effects may result from a number of individual minor direct or indirect effects that collectively may result in cumulative effects that require analysis.

Consistent with the objectives of this EA as outlined in section 1.2, the cumulative effects analysis will have two primary areas of focus: 1) the assessment of new impacts associated with Tuscarora Facility (presented in section 4.1), and 2) a summary of the cumulative effects analysis for the Transmission Line contained in *Environmental Assessment – T G Power LLC Hot Sulphur Springs Transmission Line, 120 kV Electric Power Line, Northern Independence Valley, Elko County, Nevada, March 2008,* along with supplemental information or analysis available after publication of the 2008 EA (presented in section 4.2). The cumulative effects analysis for the Jersey Valley Facility, from the *Jersey Valley Geothermal Development Project, Pershing and Lander Counties, Nevada – Environmental Assessment, Battle Mountain District Office, May 2010,* is summarized in Appendix B. The cumulative effects analysis for the McGinness Hills Facility, from the *McGinness Hills Geothermal Development Project, Lander County, Nevada – Environmental Assessment, Battle Mountain District Office, June 2011,* is summarized in Appendix C.

The geographic scope of each cumulative effects analysis is defined with the Cumulative Effects Study Area (CESA). CESAs are defined for each resource evaluated, although two or more resources may have the same CESA. The time frame for the cumulative effects analyses is 20 years, which is the estimated life of the three geothermal power plants.

For each cumulative effects analysis, past, present and reasonably foreseeable future actions are defined. Past actions are typically described in general terms without listing or analyzing the effects of individual past actions, unless they bear a relation, or are similar to, the Tuscarora Facility. Present actions are actions that are ongoing at the time of the analysis. Reasonably foreseeable future actions are those for which there are existing decisions, funding, formal proposals, or which are highly probable based on available information.

For each project, the analysis of environmental consequences was reviewed in order to determine which resources required an analysis of cumulative effects in this chapter. If the Tuscarora

Facility would have no incremental contribution to direct or indirect effects on a resource, that resource was not advanced for analysis of cumulative effects.

4.1 TUSCARORA FACILITY

The analysis of potential environmental consequences for the Tuscarora Facility in Chapter 3 was reviewed to determine which resources were appropriate for the assessment of cumulative effects. Based on that review, the following resources are evaluated in the cumulative effects analysis:

- Cultural Resources
- TES Species

There were no other resources identified for which the Tuscarora Facility's incremental effects were of concern from the standpoint of cumulative effects. There are several resources addressed in section 4.2 for the Transmission Line for which the cumulative impacts also apply to the Tuscarora Facility. Although the impacts of the Tuscarora Facility on those resources are very small, they are addressed for the sake of completeness.

4.1.1 Past, Present and Reasonably Foreseeable Future Actions

The past, present, and reasonably foreseeable future actions that would contribute to cumulative impacts for these resources include roads and rights-of-way, mineral exploration, geothermal exploration and development, the proposed Transmission Line, Tuscarora Facility expansion, wildfires, dispersed recreation, and livestock grazing. Each of these actions is described below.

Roads and ROW

The main ROW corridor established in Independence Valley and Taylor Canyon is SR 226. In addition to this paved road, several overhead power distribution and transmission lines parallel different sections of the road from its beginning at SR 225. There are also numerous secondary dirt, gravel, and two-track roads throughout the Tuscarora Facility area that connect to SR 226. Most of these roads have been present for decades and are associated with agricultural activities or exploration activity. The only new road proposed for the Tuscarora Facility is the 2.5-mile access road from SR 226 to the proposed power plant site. No other road construction is foreseen within the CESAs within the 20-year period considered in this analysis. The Ruby Pipeline (natural gas) is being constructed within the CESA. This 675-mile long 42-inch diameter pipeline is being constructed from Wyoming to Oregon.

Existing Geothermal Exploration and Development and Mineral Exploration

Geothermal exploration, including drilling and seismic studies have occurred in the area since the early 1980s. Past activity has accounted for approximately 19.3 acres of disturbance, the

majority of which has occurred on private land. Mineral exploration activities have included exploration drilling directly west of the Tuscarora Facility site and/or geophysical exploration drilling on leased and private land, and public lands immediately east of the facility, prior to the current plan for development of the power plant. Most recently, TG Power conducted geothermal exploration drilling of wells on private lands to identify and delineate existing geothermal resources for development of the power plant. Geothermal leases may include geophysical activities and exploration drilling. Additional development of the existing geothermal resource is also likely and would include public land managed by the BLM under leases held by ORMAT. Mineral exploration is likely to occur on public lands to the west as has occurred in the past. However, there are no current operations or proposals for future facilities.

Tuscarora Facility Expansion

If the geothermal resource at the Tuscarora Facility is found to be sufficient, the facility may be expanded in the future to include a second phase (Phase II). If constructed, Phase II would generate up to 19MW, similar to Phase I. The size and configuration of the Phase II facility would be similar to Phase I, including the generating unit, cooling tower, and auxiliary systems. New production and injection wells, pipelines, and expanded production facilities would also be required for Phase II. However, the location of those wells is unknown and would be determined based on future exploration. Because of the uncertainty surrounding Phase II in terms of timing, feasibility, siting, and design, Phase II is considered sufficiently speculative that this EA does not include an analysis of potential environmental impacts for Phase II construction and operation. Phase II is identified here only because if it were to occur, it may be financed with funds covered by DOE's proposed loan guarantee.

Transmission Line

ORMAT is proposing the 24.5-mile Transmission Line that would deliver power from the Tuscarora Facility to NV Energy's Humboldt Substation. Approximately 16 miles of the line would be located on private land with the remaining 8.5 miles on BLM land. The Transmission Line would be constructed within a 150-foot corridor with a total area of approximately 445 acres. Of that total, approximately 152 acres would be public lands and 293 acres would be private land. Total surface disturbance associated with the Transmission Line would be approximately 108 acres.

Wildfires

Wildfires have affected grazing and wildlife habitat use in much of the CESA area. The most recent fires included the Snow Canyon fire, the Taylor Canyon fire, and the Amazon fire, all occurring in 2006. The Snow Canyon fire burned approximately 22,319 acres in the northern part of Independence Valley, including a large area bordering the Tuscarora Facility site on the east. Over 130,000 acres of rangelands burned in 2006 (Taylor Fire) on the proposed project site

and surrounding areas. The 2005 Esmeralda Fire affected over 99,000 acres including the east side of the Tuscarora Range and west side of Independence Valley approximately 15 miles south of the Tuscarora Facility area. Emergency stabilization and rehabilitation actions that BLM has taken over the three years since these fires occurred include seeding, and closing the burned areas to grazing until revegetation objectives are met.

Dispersed Recreation

Dispersed recreation occurs on both private land and adjacent public land. Recreational activities include hunting, fishing, OHV, etc.

Grazing and Agricultural Practices

Grazing in Independence Valley has occurred since the mid 1850s with the establishment of many of the ranches in the area including the Spanish Ranch. Prior to the Taylor Grazing Act of 1934, upward of 18,000 head of cattle and 12,000 head of sheep were run on the Spanish Ranch. Similar operations were run in the area. After the Taylor Grazing Act, the number of both cattle and sheep were reduced because of unsustainable severe overgrazing. Grazing and hay production are the two largest land uses in the area of the proposed project.

4.1.2 Cultural Resources

4.1.2.1 Description of the CESA

The cultural resources CESA was identified as the entire lease area for ORMAT including both the private geothermal leases with Ellison Ranching Company and public leases issued by the BLM. Figure 12 shows the CESA boundary for cultural resources. This boundary was chosen because most of the development activity within the Independence Valley would likely occur as a result of geothermal activity.

4.1.2.2 Cumulative Effects

The Tuscarora Facility would be located in an area of high archaeological site density and could adversely affect historic properties, given the close proximity of the various facilities at the site. Most cultural resources tend to degrade over time due to natural forces but many survive for thousands and even millions of years. Modern human activity tends to exacerbate the damage and as a consequence, cultural resources are disappearing at an ever-increasing rate. Grazing damage is found at virtually all sites and damage by roads fences and agriculture is common. Most of the recorded cultural resources in the CESA exhibit impacts resulting from modern use of the land.

In combination with other past, present, and reasonably foreseeable future actions (RFFAs), the Tuscarora Facility would likely contribute to an overall decline in cultural resources. Impacts associated with grazing, agricultural activity, and wildland fires are expected to continue. Many

of the most sensitive sites are on private land and outside federal jurisdiction. Any of the activities described above could increase the proximity of surface disturbance to cultural sites, which could inadvertently destroy artifacts or site features. Newly created access routes could increase access by the public to formerly inaccessible locations, making sites susceptible to unauthorized collection, vandalism, and compaction/erosion related to recreational activities. If sites are currently used by Tribes for cultural or religious activities, construction and other surface disturbances could have detrimental effects from noise and visual intrusions.

The Tuscarora Facility would minimize its potential contribution to cumulative effects by implementing the EPMs proposed in section 2.1.7.2, in combination with an approved Historic Properties Treatment Plan, and other measures contained in the approved Section 106 Memorandum of Agreement with the Nevada SHPO. With these measures in place, the Tuscarora Facility's incremental contribution is expected to be small, and cumulative effects to cultural resources would be minimal.

4.1.3 TES Species

4.1.3.1 Description of the CESA

The CESA boundary for TES species includes the entire Tuscarora PMU and a small portion of the North Fork PMU. The portion of the CESA in the North Fork PMU includes an area within 600 meters of the Transmission Line, which extends approximately six miles into the PMU. The CESA is shown in Figure 13. The Tuscarora PMU encompasses approximately 1,385,112 acres and extends north of Interstate 80 to the Snowstorm Range and from the Humboldt County line on the west to the crest of the Independence Mountains and Tuscarora Mountains on the east. The PMU spans portions of Elko, Eureka, Humboldt and Lander counties of Nevada. Prominent mountain ranges include the Tuscarora Mountains, Snowstorm Range, Izzenhood Range, Sheep Creek Range and the southwest side of the Independence Range. Major valleys located in the PMU include Boulder Valley, Independence Valley, and Squaw Valley. Primary drainage basins include Willow Creek, Antelope Creek, Rock Creek, the upper end of the South Fork of the Owyhee River and the South Fork of the Little Humboldt River.

The majority of land in the PMU is publicly owned and managed by the Tuscarora Field Office of the BLM with a small portion (approximately 34,850 acres) of the PMU located in the west Independence Mountains managed by the United States Forest Service (USFS). The Winnemucca District Office of the BLM manages two allotments located in the Snowstorm Range. There are significant private landholdings throughout this PMU. Newmont Gold Company, Barrick Gold Company, Western States Mineral, and Ellison Ranching Company are some of the largest landowners within the Tuscarora PMU. The PMU includes all or portions of 24 grazing allotments; this includes 17 on the Elko BLM District, two on the Winnemucca BLM District, and five administered by the USFS.

Most of the Tuscarora PMU is considered to be historic sage-grouse habitat. Preferred habitat for sage-grouse is characterized by Wyoming, basin, or mountain big sagebrush; big sagebrush-bitterbrush/mountain brush vegetation types; and low sagebrush vegetation. These areas are interspersed with wet meadow areas associated with numerous creeks, springs and seeps; and dry meadows in swales, draws and ephemeral/intermittent drainage areas. Limited woodland sites include aspen, sub alpine fir and limber pine. Alfalfa fields are found in Boulder Valley, along the west slope of the Sheep Creek Range, and in Independence Valley. In addition, there are large private native hay meadows along the Humboldt River, Willow Creek, Rock Creek, and the Owyhee River.

The Tuscarora PMU is within the Elko County Sage-grouse Planning Area (ECSGPA) and has been identified as the highest at-risk PMU (ranked #1 of 10 in the ECSGPA) using a risk factor matrix (See Appendix C of the *Elko County Sagebrush Ecosystem Conservation Strategy*). Specific "priority" areas were determined to be of greater importance to sage-grouse using the aggregation of leks as a basis to determine these key areas. Based on this assessment, nine areas were determined to be critical breeding and nesting areas. They are as follows: 1) Snowstorm Flat, 2) Headwaters of Milligan Creek, 3) Scrapper Springs, 4) Rock Creek, 5) N. Willow Creek Reservoir, 6) Big Butte, 7) Willow/Soldier Creek, 8) Six Mile, and 9) Upper Independence Valley, the area affected by the Tuscarora Facility and Transmission Line. The 2005 spring breeding population for the Tuscarora PMU was estimated between 4,823 and 6,431 sage-grouse. Currently, there are 90 leks within the PMU. Of these, 28 are known to be active.

The majority of the PMU is within portions of Nevada Department of Wildlife's Management Units 062, 066, 067 and 068. These management unit designations have been in place many years and hunters are generally familiar with the boundaries. Fires have severely impacted a large percentage of the sage-grouse habitat within the Tuscarora PMU. Since 1984, over 580,000 acres (42%) have burned within this PMU. For example, the 90,000 acres consumed by the 2005 Esmerelda Fire will have long lasting impacts to the sage-grouse habitat and population levels in the PMU. Intensive seeding efforts have been approved or completed on public lands affected by the larger fires in an attempt to rehabilitate wildlife habitat. This includes areas where sage-grouse habitat rehabilitation was emphasized. At this time, the overall success of these seeding efforts is unknown. Very few of the areas that have burned within the past 20 years have recovered to the point of providing significant habitat values for sage-grouse. Cheatgrass has established over huge areas and has become the dominant vegetation often precluding the reestablishment of native vegetation, especially sagebrush.

4.1.3.2 Cumulative Effects

Wildfires have had, and would continue to have, the greatest impacts to sage-grouse habitat. Over 130,000 acres of rangelands burned in 2006 on the project site and surrounding areas in or adjacent to the CESA. The 2005 Esmeralda Fire affected over 99,000 acres in or adjacent to the CESA, including the east side of the Tuscarora Range and west side of Independence Valley approximately 15 miles south of the Tuscarora Facility area. Much of the burned area was sagebrush habitat. Post-fire rehabilitation activities including seeding of shrub, forbs, and grasses have been completed or are planned to help restore lost habitat.

Conversion of sagebrush habitat to agricultural production significantly modified greater sage-grouse habitat. However, greater sage-grouse appear to be abundant in the adjacent areas, as evident by the number of active leks in these adjacent sagebrush areas. In addition, surface water in the Independence Valley, such as Harrington Creek, upper reaches of Hot Creek, and the South Fork of the Owyhee River, provides good brood rearing habitat.

The Tuscarora Facility, in combination with the Transmission Line that would extend east to the Humboldt Substation, is expected to indirectly affect approximately 8,091 acres of intact "Category 1" sage-grouse habitat. This includes 5,725 acres (approx. 12 miles X 1,200 meter corridor) where the proposed transmission line route does not coincide with existing roads or power lines. An additional 2,366 acres of indirect effect are due to the zone of influence of the Tuscarora power plant site. Proposed EPMs would help to minimize the cumulative effects of the Tuscarora Facility and Transmission Line southeast to the Humboldt Substation. Potential direct effects could include injury or mortality during surface-clearing activities. Project-generated noise and human activity may deter some sage-grouse from using the area surrounding the project. Increased mortality and injury would result from increased vehicular traffic. Fragmentation of habitat may result from reduced access to seeps, springs, wet meadow, and riparian areas.

Although impacts to sage-grouse from the Tuscarora Facility are likely, the cumulative effects are not likely to substantively and negatively impact sage-grouse, primarily because of the extensive effort to address the impacts of fire-damaged lands and to implement a voluntary conservation plan for the proposed action. Section 2.1.7.4 contains numerous EPMs to minimize impacts to sage-grouse, some of which would be triggered by monitoring results that show levels exceeding pre-established thresholds. Those measures are presented in detail in Appendix A. The Tuscarora Facility would utilize these measures to minimize its potential contribution to cumulative effects to special status species. The habitat rehabilitation and power line retrofit measures, which are a part of the many measures expected to be implemented with the monies from the voluntary conservation fund, should substantially improve sage-grouse habitat over several years. Considering the measures proposed to reduce direct and indirect impacts, along

with the voluntary conservation fund measures that will address impacts from wildfires and existing power lines, the Tuscarora Facility is not expected to contribute to substantial adverse cumulative impacts.

4.2 TRANSMISSION LINE

This section summarizes and provides supplemental information or analysis for selected portions of the Transmission Line cumulative effects analysis, which is contained in the *Environmental Assessment – TG Power LLC Hot Sulphur Springs Transmission Line, Bureau of Land Management, Elko Field Office, March 2008,* and which is incorporated by reference in this EA. Resources that are summarized, or for which supplemental information or analysis is provided in this EA include:

- Vegetation
- Noxious Weeds and Invasive, Non-Native Species
- Wildlife
- Migratory Birds
- TES Species
- Range Resources
- Cultural Resources
- Visual Resources

4.2.1 Past, Present and Reasonably Foreseeable Future Actions

The past, present, and reasonably foreseeable future actions that would contribute to cumulative effects associated with the Transmission Line include geothermal exploration and development, mineral exploration, the Tuscarora Facility, Tuscarora Facility expansion, grazing and ranch development, wildfires, and roads and other rights-of-way, transmission lines and substations, and the Ruby natural gas pipeline. Those activities are summarized below.

Geothermal Exploration and Development and Mineral Exploration

Past activities have included exploration drilling directly west of the Tuscarora Facility site and/or geophysical exploration drilling on leased and private land that preceded the current plan for development of the power plant. Exploration drilling for locatable minerals (gold) has also been completed by Queenstake Resources USA, Inc. near Starvation Canyon on the southern end of the Independence Mountain range. Geothermal exploration, including drilling and seismic studies has occurred in the area since the early 1980s.

Queenstake Resources USA, Inc. is continuing to conduct exploration drilling for development of an underground precious metal operation in the area of their Starvation Canyon exploration area. This operation is anticipated to include a small facilities area, underground operations,

waste rock facility, and an access road to SR 226. It would also be located on private land except for a short section of BLM land along the access road.

Tuscarora Facility

The Tuscarora Facility would consist of a 19 net megawatt electrical generating facility, production and injection wells, and ancillary facilities. The power plant would be located in Elko County, Nevada approximately 70 miles north of Elko, Nevada in Independence Valley (Figure 2). Features of the Tuscarora Facility are described in detail in section 2.1.

Tuscarora Facility Expansion

If the geothermal resource at the Tuscarora Facility is found to be sufficient, the facility may be expanded in the future to include a second phase (Phase II). If constructed, Phase II would generate up to 19MW, similar to Phase I. The size and configuration of the Phase II facility would be expected to be similar to Phase I, including the generating unit, cooling tower, and auxiliary systems. New production and injection wells, pipelines, and expanded production facilities would also be required if Phase II were to occur. However, the location of those wells is unknown and would be determined based on future exploration. Because of the uncertainty surrounding Phase II in terms of timing, feasibility, siting, and design, Phase II is considered sufficiently speculative that this EA does not include an analysis of potential environmental impacts for Phase II construction and operation. Phase II is identified here only because if it were to occur, it may be financed with funds covered by DOE's proposed loan guarantee.

Grazing and Ranching

Grazing in Independence Valley has occurred since the mid 1850s with the establishment of many of the ranches in the area including the Spanish Ranch. Prior to the Taylor Grazing Act of 1934, upward of 18,000 head of cattle and 12,000 head of sheep were run on the Spanish Ranch. Similar operations were run in the area. After the Taylor Grazing Act, the number of both cattle and sheep were reduced. Grazing and hay production are the two largest land uses in the area of the Transmission Line. Grazing and crop production on public and private lands is an ongoing activity by the ranching operations in Independence Valley. Current livestock grazing and ranching would continue to occur in the reasonably foreseeable future within the CESA area. Grazing on public lands would be subject to multiple use management strategies, terms and conditions of permits, and fire closures by BLM.

Wildfires

Wildfires have affected grazing and wildlife habitat use in much of the CESA. The most recent fires included the Snow Canyon fire and the Taylor Canyon fire, both occurring in 2006. The Snow Canyon fire burned approximately 22,319 acres in the northern part of Independence Valley, and the Taylor Canyon fire burned approximately 4,467 acres in the south end of the

Independence Valley and Independence Mountains. Emergency stabilization and rehabilitation actions that BLM has taken over the three years since these fires occurred include seeding, and closing the burned areas to grazing until revegetation objectives are met.

Wildfires are likely to continue to occur within the Independence Valley, areas to the west, and the Independence Mountains. It is impossible to predict the location and size of future fires, but within the next 20 years, one or more large fires will likely occur within the CESA. Similar to the 2006 fires, BLM would take actions as necessary to suppress fires and stabilize and rehabilitate the burned areas, in cooperation with other federal, state and local agencies and affected landowners.

Roads and Rights-of-Way

The main ROW corridor in Independence Valley and Taylor Canyon is SR 226. In addition to this paved road, several overhead power distribution and Transmission Lines parallel different sections of SR 225. Road maintenance activities on SR 226 and adjacent roads are conducted on an as-needed basis. This includes surface maintenance and snow removal on SR 226 and grading on secondary roads. Many of the roads leading from SR 226 are on private land and are thus maintained by the landowner.

Electrical Transmission Lines and Substations

Approximately 45 miles of transmission and distribution lines run through the visual resources CESA. There are also numerous secondary dirt, gravel, and two-track roads that connect to SR 226. These roads total approximately 150 miles within the CESA area. Existing power and Transmission Lines include: Humboldt Substation; Humboldt 120 kV line; Oreana to Hunt Idaho 345 kV Transmission Line; Anglo Gold 120 kV line; Tuscarora Buried Power Line; existing power line east of SR 226 in Independence Valley; existing power line and associated single phase lines from Taylor Canyon area to Tuscarora; and individual variable phase power lines to home/business structures in Independence Valley.

Ruby Pipeline

The Ruby Pipeline is a natural gas transmission pipeline, beginning at the Opal Hub in Wyoming and terminating near Malin, Oregon. Ruby will have an initial design capacity of up to 1.5 billion cubic feet per day (Bcf/d). The pipeline will be approximately 680 miles long and traverse portions of Wyoming, Utah, Nevada, and Oregon. The project utilizes four compressor stations, one of which (the Wieland Flat Compressor Station) is at the mid-point of the project north of Elko, Nevada. (Ruby, 2011)

4.2.2 Description of Transmission Line CESAs

CESAs for the following resources were defined in figures contained in the Transmission Line EA, as shown in Table 11. For the noxious weeds/invasive non-native species resource, the CESA was defined as extending approximately 1.5 miles on both sides of the transmission line corridor, which encompasses approximately 52,000 acres. For wildlife, migratory birds, and special status species, this EA will use the CESA for the Tuscarora Facility as shown in Figure 13. That CESA includes the entire Tuscarora PMU and a small portion of the North Fork PMU (see section 4.1.3.1).

Table 11 CESA Figures in the Transmission Line EA

Figure	Resource
Figure 5	Vegetation
Figure 9	Range Resources
Figure 10	Visual Resources
Figure 11	Cultural Resources

4.2.3 Vegetation

Disturbance associated with construction of the Transmission Line would total 108 acres, of which 86 acres would be temporary, and 22 acres would be permanent. Surface disturbance associated with the Tuscarora Facility would affect 63 acres, of which 17 acres would be temporary, and 46 acres would be permanent. Combined, the two projects would permanently disturb approximately 69 acres of existing vegetation.

The Transmission Line, in combination with past, present, and reasonably foreseeable future actions would have numerous potential impacts to vegetation. Typical impacts would include clearing of vegetation for roadways, construction areas, buildings, pipelines, and other utilities. Maintenance around projects would involve mowing, herbicide treatment, and other mechanical or chemical means of removal and control. The risk of fire would result from equipment operation, vehicle traffic, electrical lines, and smoking. Fires destroy vegetation and can aid in the establishment of invasive species. In addition, wildfires are likely to continue to occur within the Independence Valley, areas to the west, and the Independence Mountains. Containment basins, site clearing, grading, constructing access roads, site runoff, and vehicle and human foot traffic can cause soil erosion, resulting in topsoil removal, native vegetation loss, invasive species establishment, stream sedimentation, and flooding (which can affect riparian vegetation and riparian habitats). Finally, vehicle fuel, hydraulic fluid, solvents, cleaners, and geothermal fluids can all be harmful to vegetation. Accidental spills can contaminate soils and water and directly harm vegetation. Herbicide use to control vegetation may result in spills, or acute exposure to herbicides may have adverse effects on non-target vegetation.

The Transmission Line would minimize its potential incremental contribution to cumulative effects to vegetation by implementing the EPMs proposed in section 2.2.4 (Decommissioning and Reclamation), in combination with other measures. With these measures in place, cumulative effects on vegetation would be minimal.

4.2.4 Noxious Weeds and Invasive, Non-Native Species

The combined past, present, and reasonably foreseeable future actions within the CESA have the potential to create conditions favorable for the establishment/invasion of invasive non-native species and noxious weeds, and other undesirable plants. Future occurrence of a large wildland fire poses the greatest risk for invasion of weeds in the area. Consistent with BLM policy, use of suitable seed mixes with only certified and tested seed, combined with implementation of prompt and appropriate revegetation techniques would reduce the potential for undesired weeds to invade burned areas. The potential for the establishment of noxious and/or invasive non-native weeds within the CESA area may be greater if the fire burns on private lands where federal involvement is limited. The EPMs proposed for the Transmission Line in the 2008 EA, and section 2.2.4 (Decommissioning and Reclamation) of this EA, are standard operating procedures that that are applied to all BLM actions to prevent weed species from spreading and dominating disturbed sites (i.e., cleaning the undercarriage of vehicles prior to entering the project area). With these measures in place, the Tuscarora Facility's incremental contribution is expected to be small, and cumulative effects from the spread of noxious weeds and invasive non-native species would be minimal.

4.2.5 Wildlife

The Transmission Line, in combination with other past, present, and reasonably foreseeable future actions would affect wildlife through the alteration, removal, reduction, or fragmentation of habitat. Habitat at roadways, and transmission corridors would be affected. Equipment used for clearing vegetation, roadways, and vehicles used during operation and reclamation would affect wildlife that are not mobile enough to avoid construction operations. Reptiles, amphibians, and small mammals would be most susceptible.

Access roads can increase access and use of land by recreationalists and other users of public lands. This would increase the amount of human presence and the potential for impacts on wildlife from hunting, vehicle collision, harassment, and legal or illegal taking of wildlife.

Noise from transmission line development and other uses (vehicles and machinery) can have adverse impacts on wildlife. The most adverse impacts associated with noise could occur if critical lifecycle activities are disrupted (e.g., mating and nesting). This is of particular concern with regard to sage-grouse (see section 3.1.12). Disturbance occurring during mating, nesting, or rearing of young can cause wildlife to abandon mating and nesting activities, and can strand young, leaving them susceptible to predation and starvation.

Fragmentation would affect wildlife by altering how wildlife species use habitat. Fragmentation can separate wildlife populations into smaller populations, making them more vulnerable to predation, drought, and disease. Animals displaced by fragmentation would occupy nearby habitats, which could lead to an increase in competition for resources, and result in decreased health and potentially death for less fit individuals. Areas adjacent to disturbance would likely be avoided by wildlife; therefore, the amount of habitat actually affected from disturbance and fragmentation would extend beyond the habitat disturbed. Finally, fragmentation can facilitate the spread and introduction of noxious weeds or invasive, non-native plant species.

Wildfires have severely impacted a large percentage of wildlife habitat within the CESA (Figure 11). Since 1984, over 580,000 acres (42%) have burned within Tuscarora PMU. For example, the 90,000 acres consumed by the 2005 Esmerelda Fire will have long lasting impacts to the sage-grouse habitat and population levels. Intensive seeding efforts have been approved or completed on public lands affected by the larger fires in an attempt to rehabilitate wildlife habitat. This includes areas where sage-grouse habitat rehabilitation was emphasized.

Section 2.2.3.1 of this EA contains EPMs to minimize impacts to wildlife (including sage-grouse), some of which would be triggered by monitoring results that show levels exceeding pre-established thresholds. Additional measures are presented in detail in Appendix A. The Transmission Line would utilize these measures to minimize its potential incremental contribution to cumulative effects to wildlife. With these measures in place, cumulative effects on wildlife are expected to be minimal.

4.2.6 Migratory Birds

Many of the potential impacts to migratory birds result from the factors discussed in section 4.2.5. The Transmission Line, in combination with other past, present and reasonably foreseeable future actions, will contribute to the cumulative loss of additional nesting and foraging habitat in the CESA. Other activities in the CESA, such as grazing and ranching activities, and wildfires would also contribute to the loss of individual birds, young birds, and nests due to ground disturbing activities. Section 2.2.2 of this EA contains EPMs intended to minimize potential cumulative effects to migratory birds. With these measures in place, the Tuscarora Facility's incremental contribution is expected to be small, and cumulative effects on migratory birds are expected to be minimal.

4.2.7 TES Species

Because the Tuscarora Facility and Transmission Line share the same CESA for TES Species, the reader should refer to section 4.1.3 for a full discussion of potential cumulative effects to TES Species. Although impacts to sage-grouse from the Transmission Line are likely, the

cumulative effects are not likely to adversely affect sage-grouse, primarily because of the extensive effort to address the impacts of fire damaged lands, and to implement a voluntary conservation plan for the proposed action. Section 2.2.2 contains numerous EPMs intended to minimize impacts to sage-grouse, some of which would be triggered by monitoring results that show levels exceeding pre-established thresholds. Those measures are presented in detail in Appendix A. The Transmission Line would utilize these measures to minimize its potential incremental contribution to cumulative effects to special status species. The habitat rehabilitation and power line retrofit measures, which are a part of the many measures expected to be implemented with the monies from the voluntary conservation fund, should substantially improve sage-grouse habitat over several years. Considering the measures proposed to reduce direct and indirect impacts, along with the voluntary conservation fund measures that will address impacts from wildfires and existing power lines, the Transmission Line is not expected to contribute to substantial adverse cumulative impacts.

4.2.8 Range Resources

The CESA for range resources includes all of the Eagle Rock and Taylor Canyon allotments as well as a portion of the Spanish Ranch allotment. The entire Spanish Ranch allotment was not included due to the large size and distance from the project area. The permittee for the Spanish Ranch grazing allotment (Ellison Ranching Company) also owns lands where the Tuscarora Facility and Transmission Line would be developed. ORMAT has obtained permission of the other ranchers that own lands crossed by the Transmission Line.

The Transmission Line, in combination with other past, present and reasonably foreseeable actions, would affect large areas of grazing in the short term during temporary construction. Impacts would include loss of forage, reduced forage palatability because of dust on vegetation, and displacement of livestock from construction noise. Additional roads could also impact livestock by opening up areas that were not previously accessible, thereby increasing disturbance or harassment of livestock. Grazing use in portions of the CESA area has also been temporarily affected by recent wildfires followed by grazing closures on portions of the allotments that burned. In the long-term, grazing areas temporarily disturbed by construction activities would be restored to permanent use.

Section 2.2.4 contains measures for reclamation of disturbed areas intended to minimize impacts of the Transmission Line and its potential incremental contribution to cumulative effects to range resources. With these measures in place, cumulative effects on range resources are expected to be minimal.

4.2.9 Cultural Resources

The Cultural Resources CESA includes parcels of public land and subsurface mineral estate that are leased for geothermal resources. The Tuscarora Facility, which is located within the Cultural Resources CESA for the Transmission Line, would be located within an area of high archaeological site density and potentially could adversely affect historic properties. The Transmission Line, in combination with other past, present, and reasonably foreseeable uses would likely contribute to an overall decline in cultural resources in the CESA.

Most cultural properties tend to degrade over time due to natural forces but many survive for thousands and even millions of years. Modern human activity tends to exacerbate the damage and as a consequence cultural resources are disappearing at an ever-increasing rate. Most of the recorded cultural resources in the CESA exhibit impacts resulting from current land uses and activities. Not all damages attributable to these actions are well understood or can be controlled. Grazing has likely had major impacts to cultural resources in the past due to the large number of livestock grazed in the CESA. Grazing damage is found at virtually all sites and damage by roads, fences, and agriculture is common. Several archaeological sites in the project area were damaged in recent years during geothermal exploration by a previous operator. A drill pad and staging area were built on top of one of the eligible properties on private land. Queenstake's mining activity is primarily on private land outside of federal jurisdiction, and in an area with low cultural resources sensitivity. Impacts to historic properties are unlikely. Many of the most sensitive sites are on private land and outside of federal jurisdiction. Although harder to quantify, the paucity of artifacts at some sites is probably due to removal by artifact collectors. Because much of the damage has already been done, estimated future impacts would be limited.

Section 3.2.13 contains measures intended to minimize impacts of the Transmission Line, and its potential incremental contribution to cumulative effects to cultural resources. Similar measures to limit cultural resource impacts would be implemented for other uses authorized by the BLM and other federal and state agencies. Further, BLM's Section 106 review would be expected to avoid or minimize adverse impacts to any cultural properties that may be affected by those actions. With these measures in place, the Transmission Line's contribution would be small, and cumulative effects on cultural resources would be expected to be minimal.

4.2.10 Visual Resources

Surface disturbance within the CESA area has the potential to result in short- and long-term impacts to visual quality, principally affecting the elements of line and color. Public lands in the CESA are designed as either VRM Class III or Class IV. The Transmission Line, in combination with past, present and reasonably foreseeable future actions (including the Tuscarora Facility, and the activity associated with the Queenstake Resources USA, Inc. exploration and future mining activity near Starvation Canyon) would have an adverse effect on visual resources in the

CESA. However, the level of impact, when combined with past, present, and reasonably foreseeable future actions are consistent with the extent of change to the landscape permitted in the VRM Class III and IV designations. Consequently, the Transmission Line's incremental contribution is consistent with the expected change, and cumulative effects to visual resources would be minimal.

5.0 CONSULTATION AND COORDINATION

This EA was prepared by JBR Environmental Consultants, Inc. under the direction of the DOE, as NEPA Lead Agency, and the BLM Tuscarora Field Office, Elko, Nevada as a NEPA Cooperating Agency. Assistance was provided by DOE and BLM resource specialists in consultation with other local, state, federal and Native American personnel. Information and analysis in this EA is based on review of company and agency files, existing published information, computer modeling (noise and groundwater), field reconnaissance, and field surveys.

5.1 TUSCARORA FACILITY

5.1.1 Preparers

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Ely Shoshone Tribe
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Ft. McDermitt Paiute-Shoshone Tribe
Goshute Business Council
Goshute Tribe
South Fork Band
Te-Moak Tribal Council
Timbisha Shoshone Tribe
Wells Band
Yomba Shoshone Tribe
Western Shoshone Committee
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Western Shoshone Defense Project
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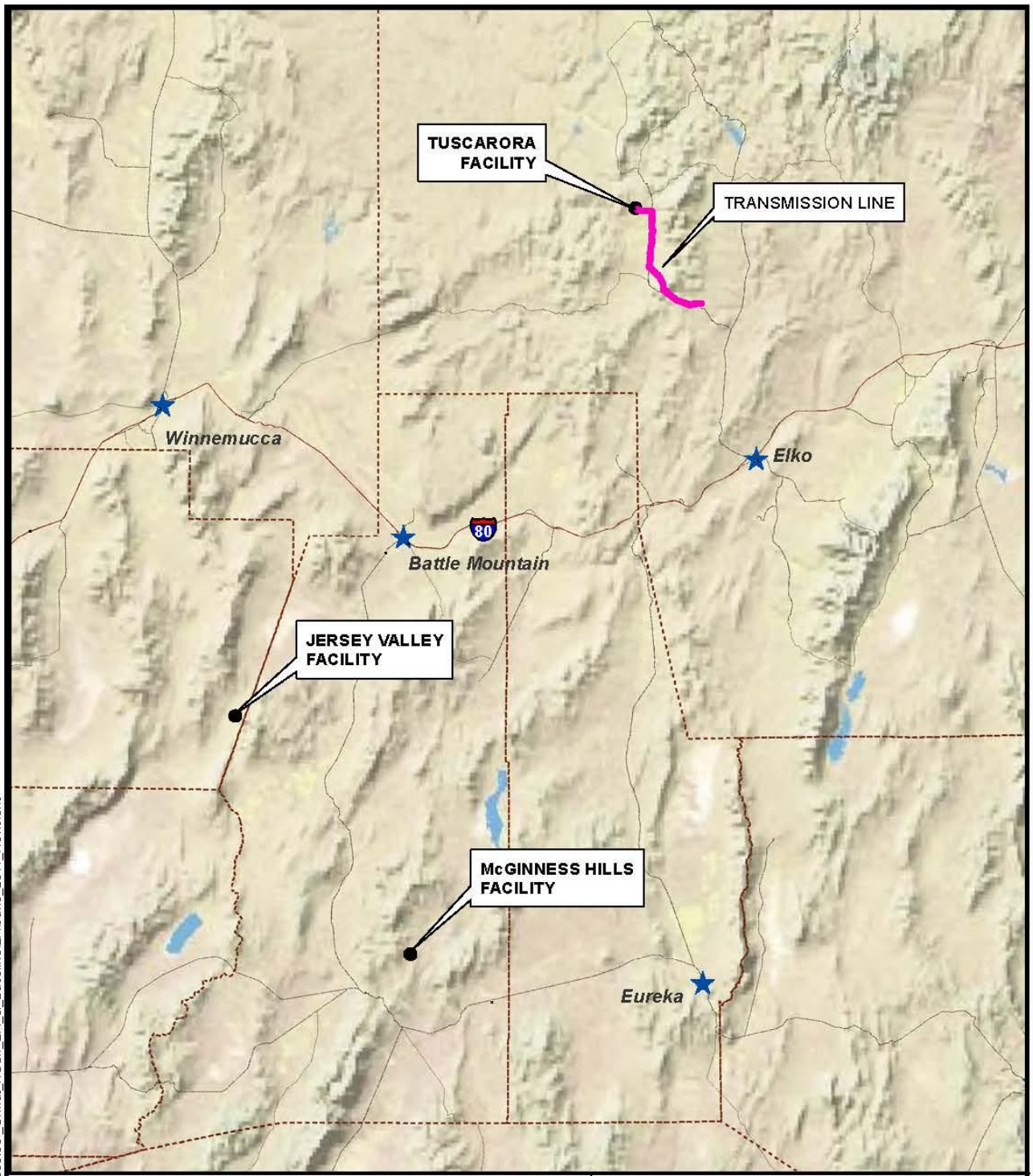
FIGURES



BASE : National Geographic US Topographic Map

25 12.5 0 25 Miles

N

ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 1
PROJECT LOCATIONS

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 24 miles

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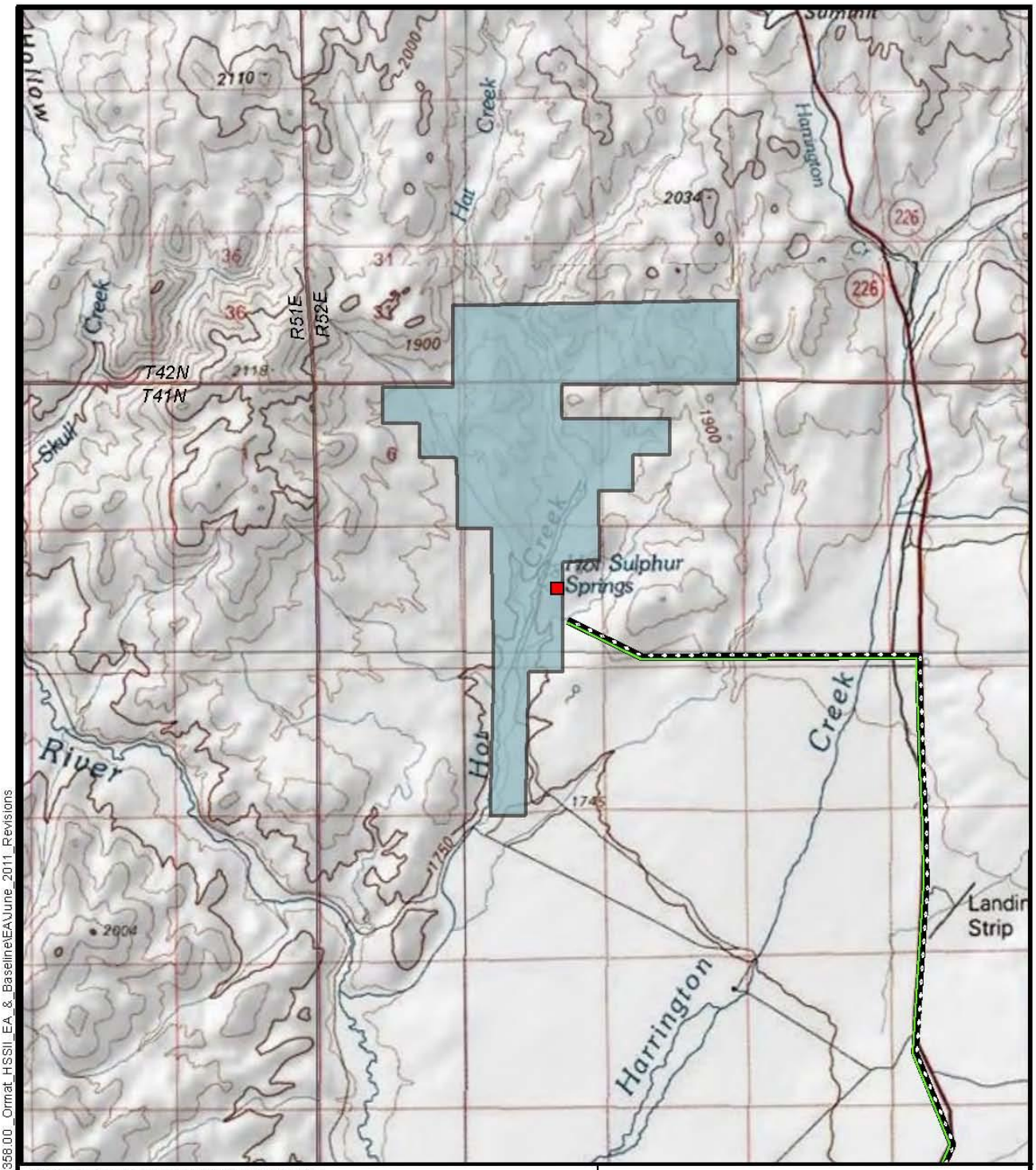

BASE : National Geographic US Topographic Map

Project Location

Power Plant

Transmission Line

1 0.5 0 1 Miles

N

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NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 2
TUSCARORA FACILITY LOCATION

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 1 miles

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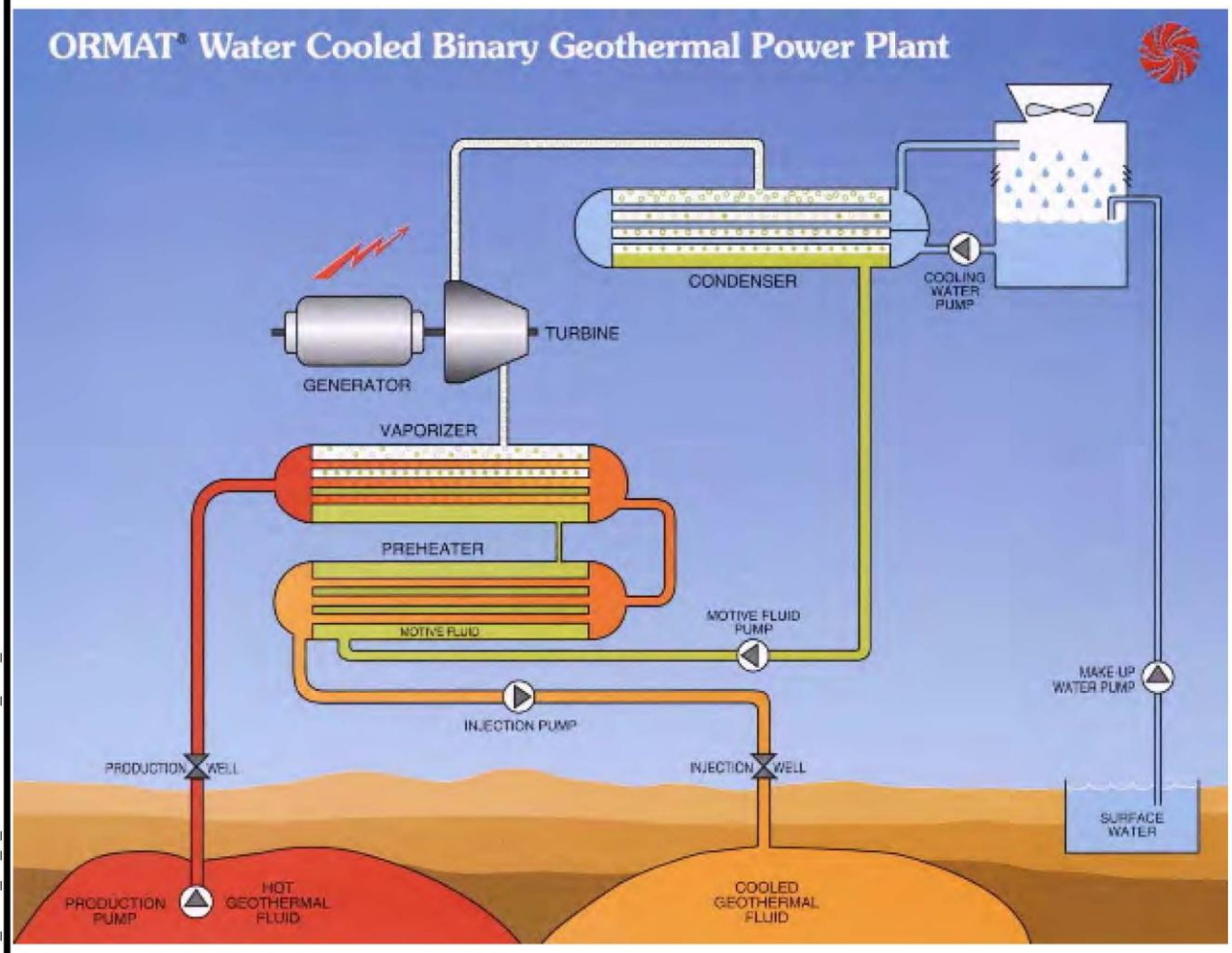

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NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 3
RANKIN ORGANIC CYCLE

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SCALE	NOT TO SCALE

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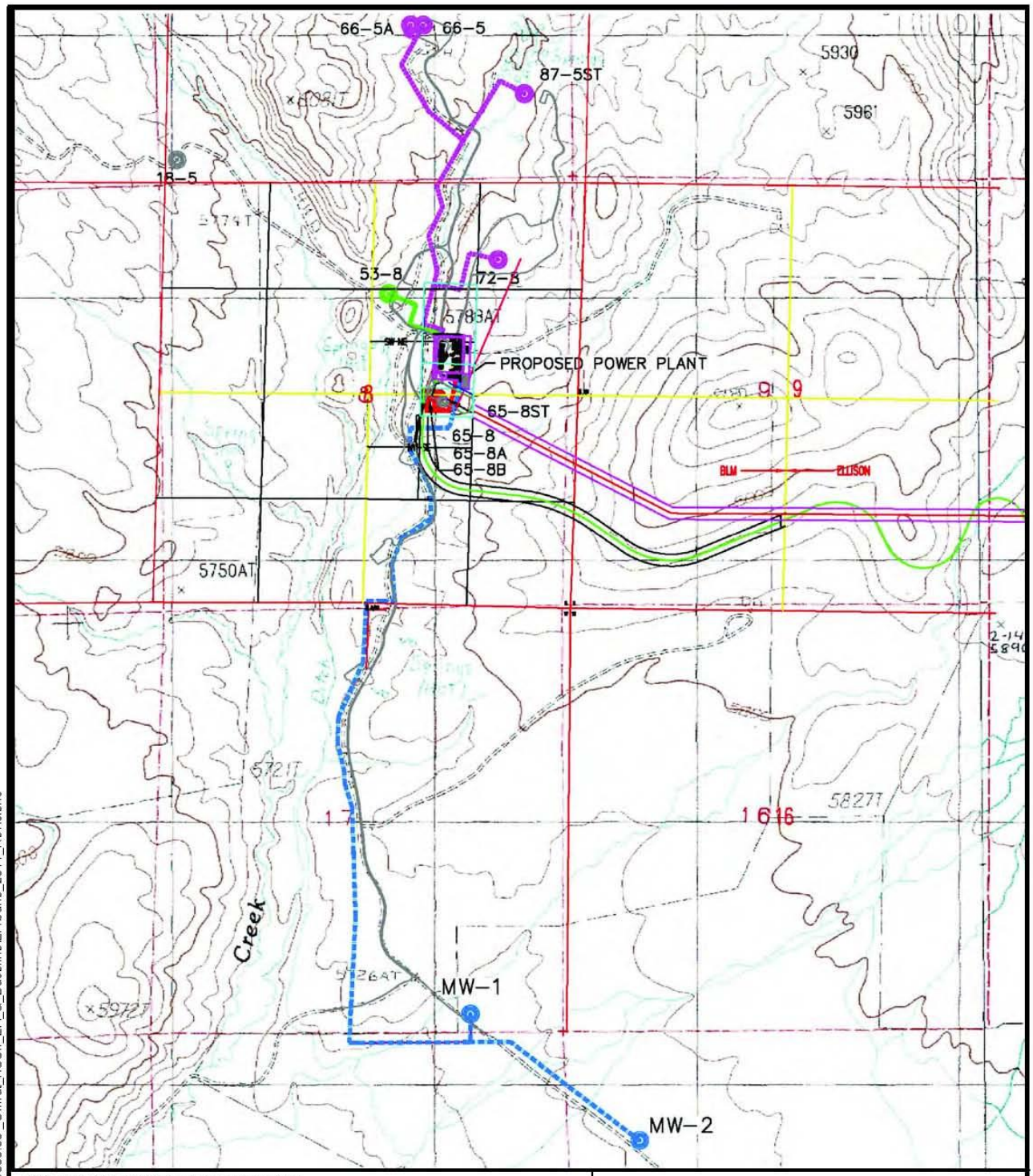

BASE : USGS 1:24,000-Scale Topographic Map

LEGEND
PRODUCTION LINE
INJECTION LINE
MAKE UP LINE
BLOW DOWN
T-LINE
ACCESS ROAD

1,200 600 0 1,200 Feet

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NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 4 TUSCARORA FACILITY PROJECT COMPONENTS

DRAWN BY	DATE DRAWN
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SCALE 1 in = 1,200 feet

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ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL
POWER PLANT PROJECTS

FIGURE 5 TYPICAL GEOTHERMAL
PIPELINE WITH CONCRETE SUPPORTS

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DRAWN BY	DATE DRAWN
CHJ	6/21/2011
SCALE	NOT TO SCALE

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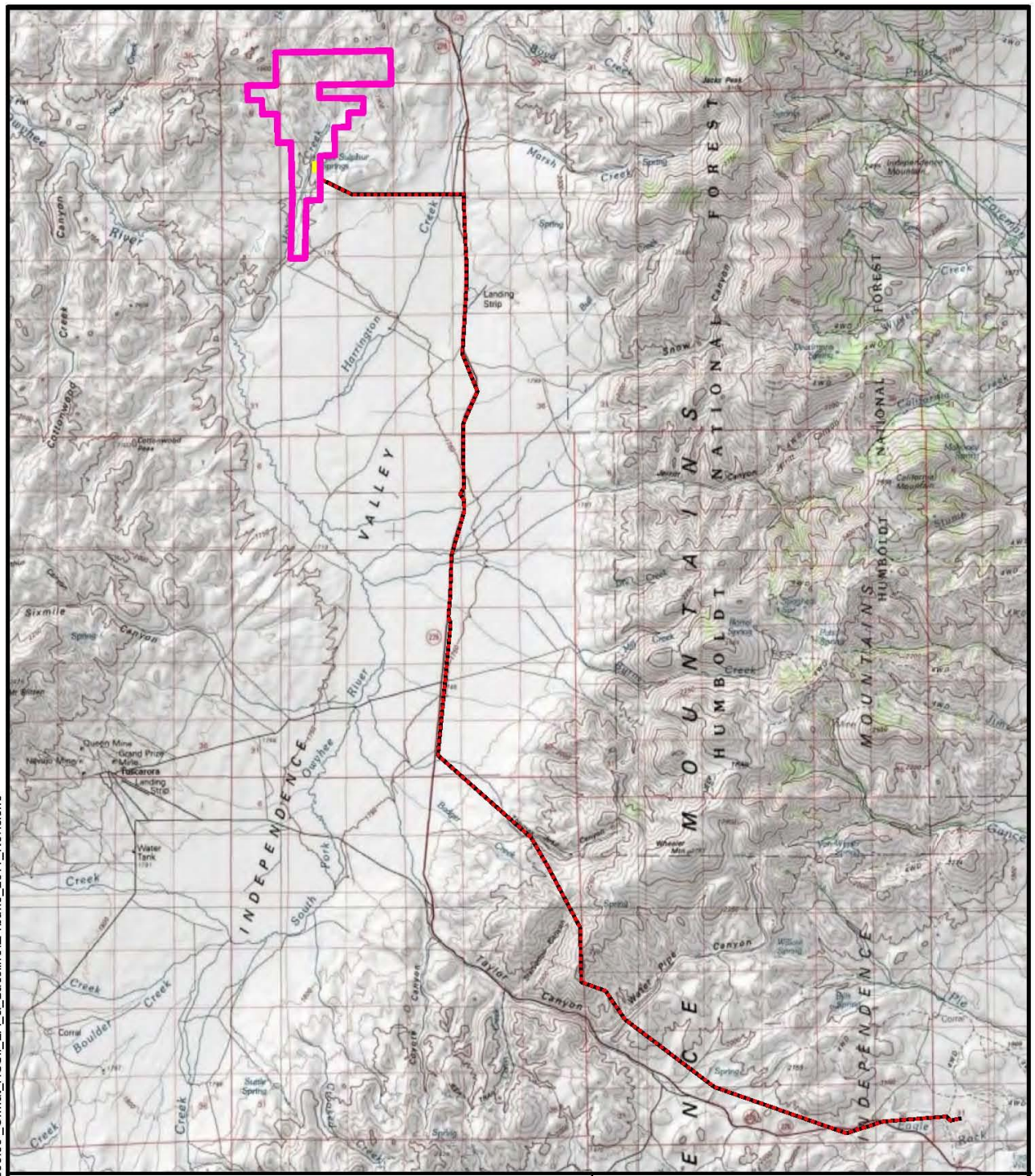

BASE : USGS 1:100,000-Scale Topographic Map

Transmission Line Route

Power Plant

Project Boundary

2 1 0 2

Miles

N

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NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 6
HOT SULPHUR SPRINGS TUSCARORA TRANSMISSION LINE

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 2 miles

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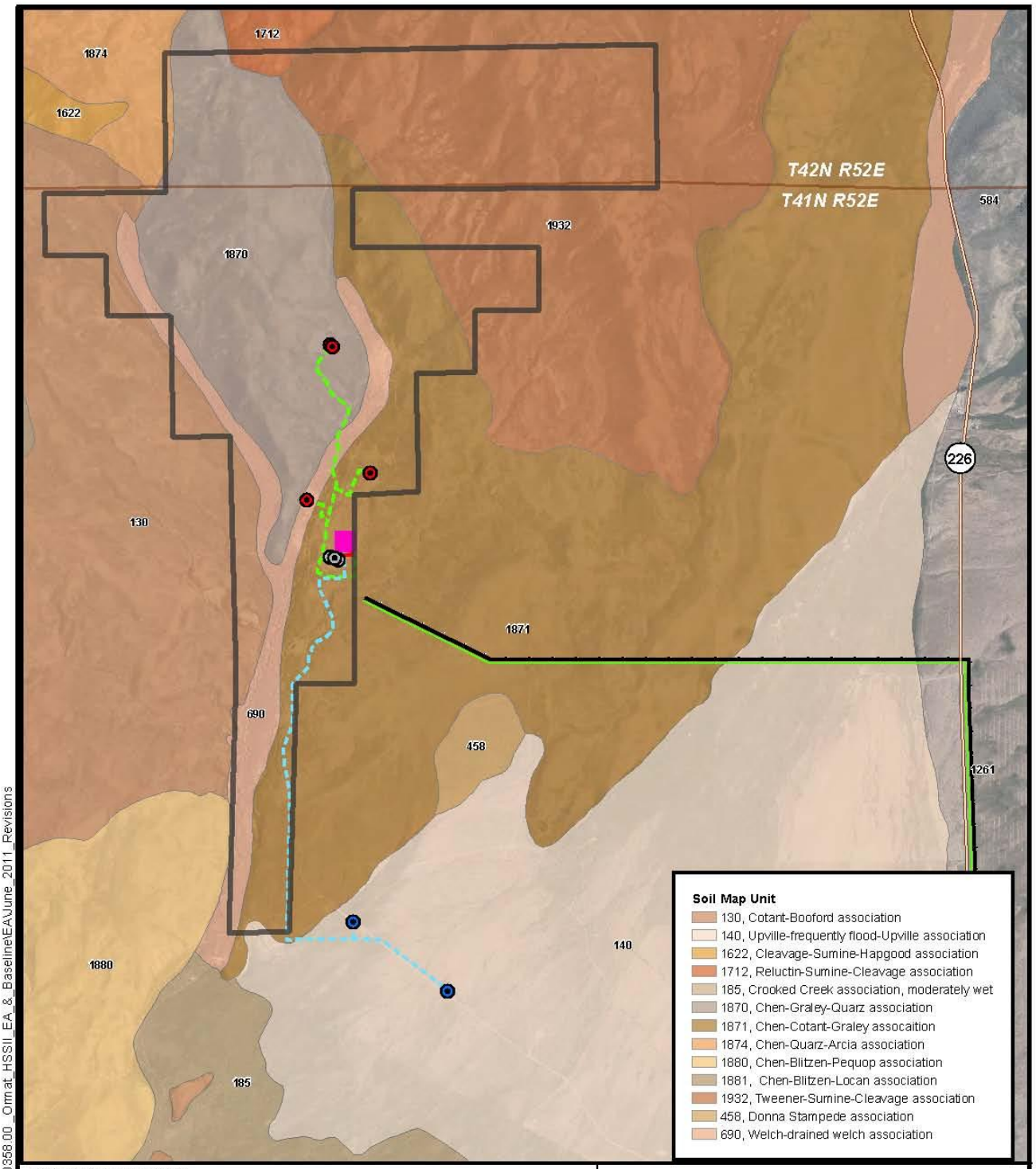

BASE : NAIP Image, 2006

Project Boundary
Power Plant
Injection Wells
Transmission Line
Production Wells
Production Line
Fresh Water Wells
Fresh Water Line
Injection Line

2,900 1,450 0 2,900 Feet

N

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NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 7
TUSCARORA FACILITY SOILS

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 2,900 feet

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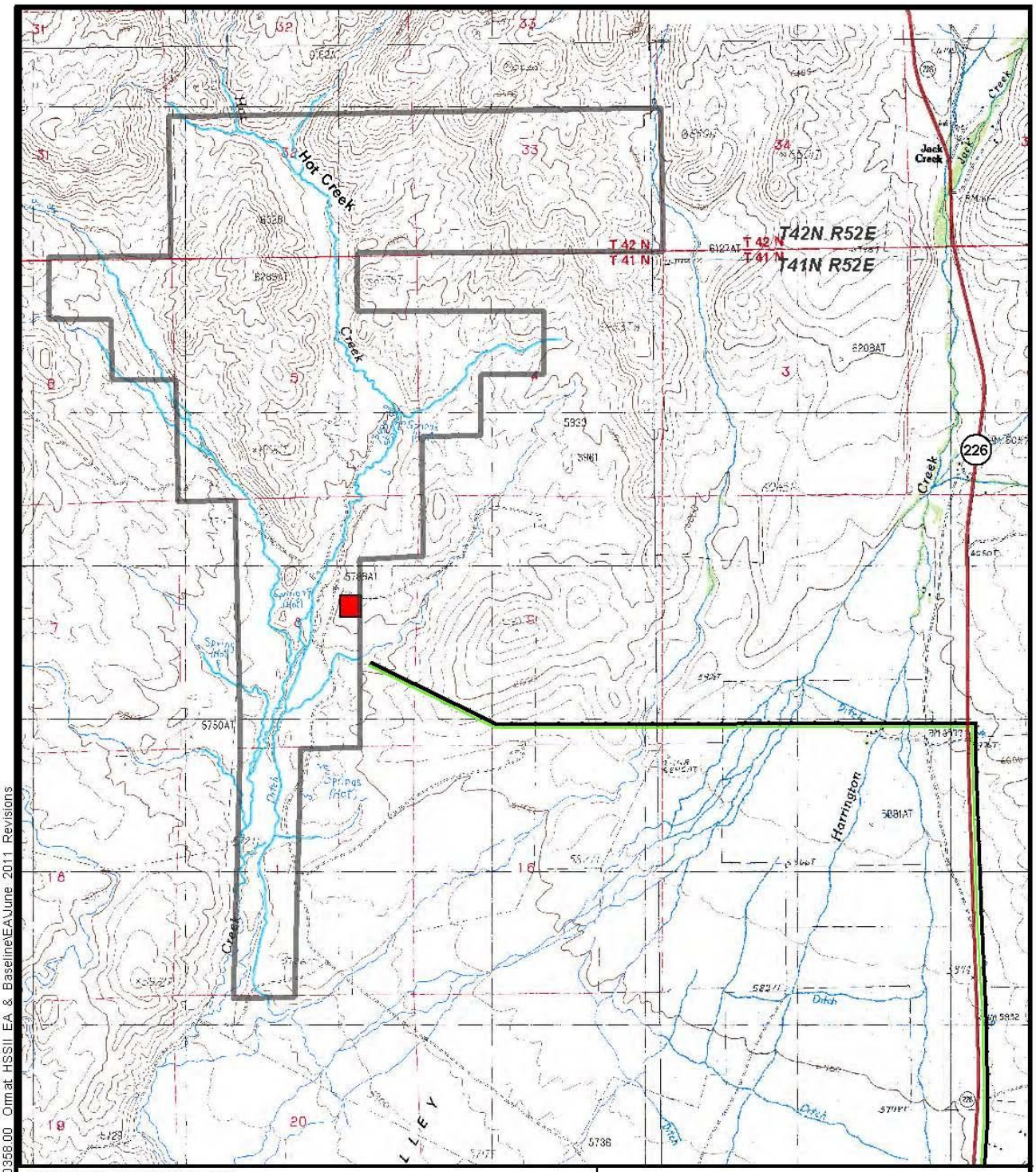


BASE :USGS 1:24,000 Scale DRGs

- Project Boundary
- Power Plant
- Transmission Line
- Waters of the U.S.

2,900 1,450 0 2,900 Feet

N

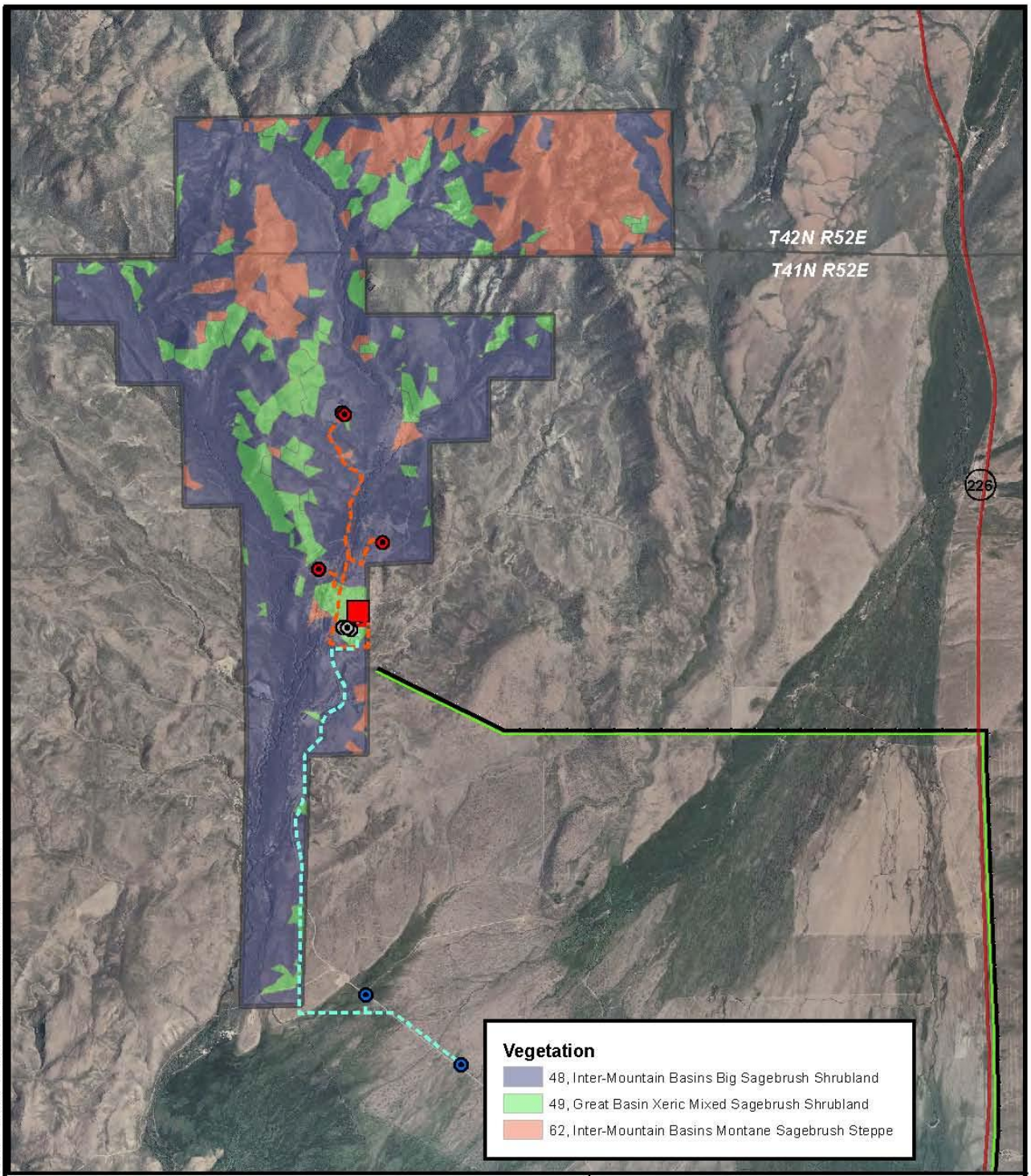
ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 8
TUSCARORA FACILITY WATER RESOURCES

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 2,900 feet

File Path: P:\X Drive\ELKO_Office\B A10368.00 Ormat HSSII EA & Baseline\EA\June 2011 Revisions



BASE : NAIP Image, 2010

Project Boundary
Power Plant
Injection Wells
Transmission Line
Production Wells
Production Line
Fresh Water Wells
Fresh Water Line
Injection Line

2,900 1,450 0 2,900 Feet

N

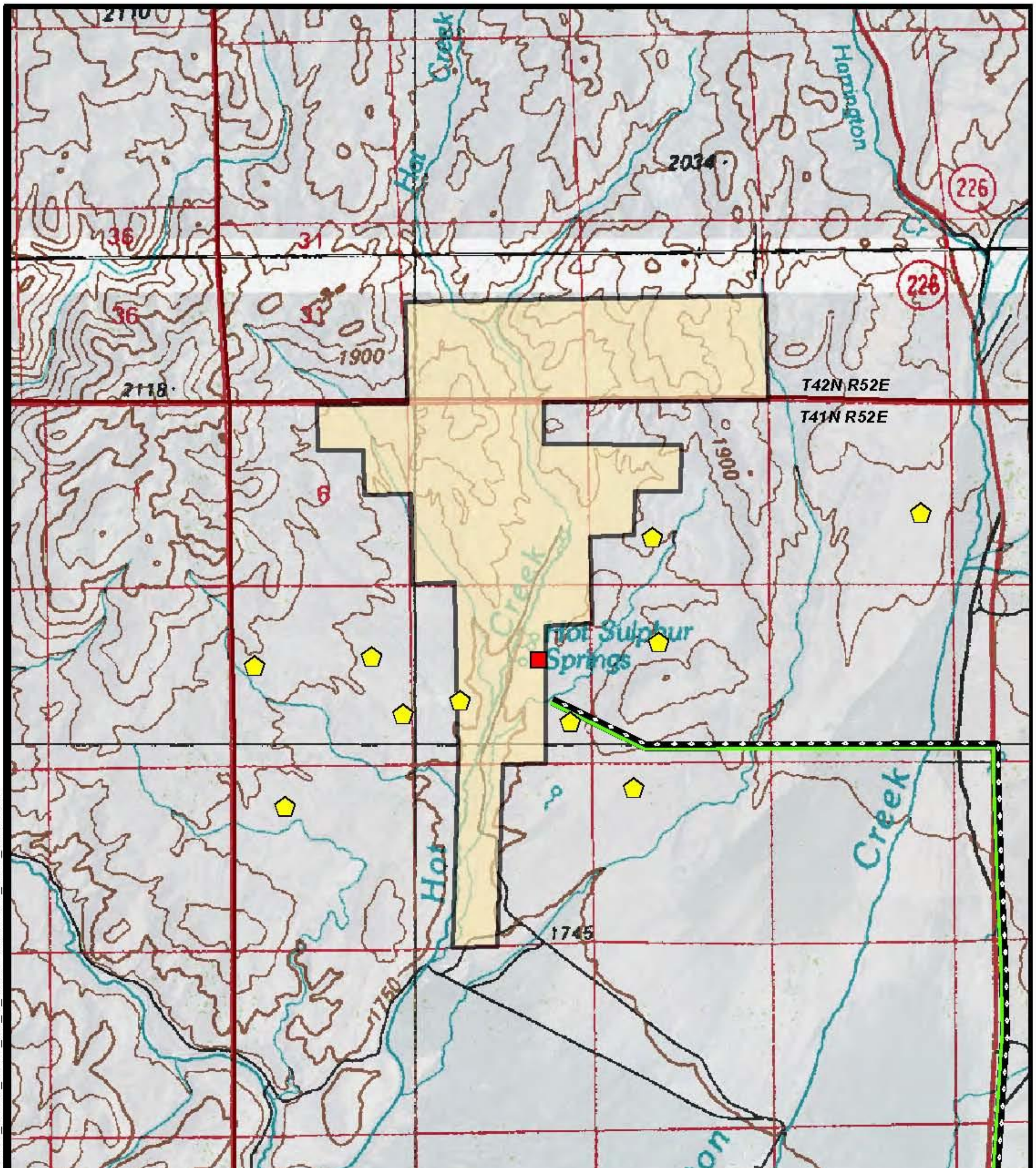
ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 9
TUSCARORA FACILITY VEGETATION

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 2,900 feet

File Path: P:\X Drive\ELKO_Office\B A10358.00 _Ormat_HSSII_EA_&_Baseline\EA\June_2011_Revisions



BASE :USGS 1:100,000 Scale DRGs

Project Site

Sage-Grouse Lek Locations

Power Plant

Transmission Line

4,000 2,000 0 4,000 Feet

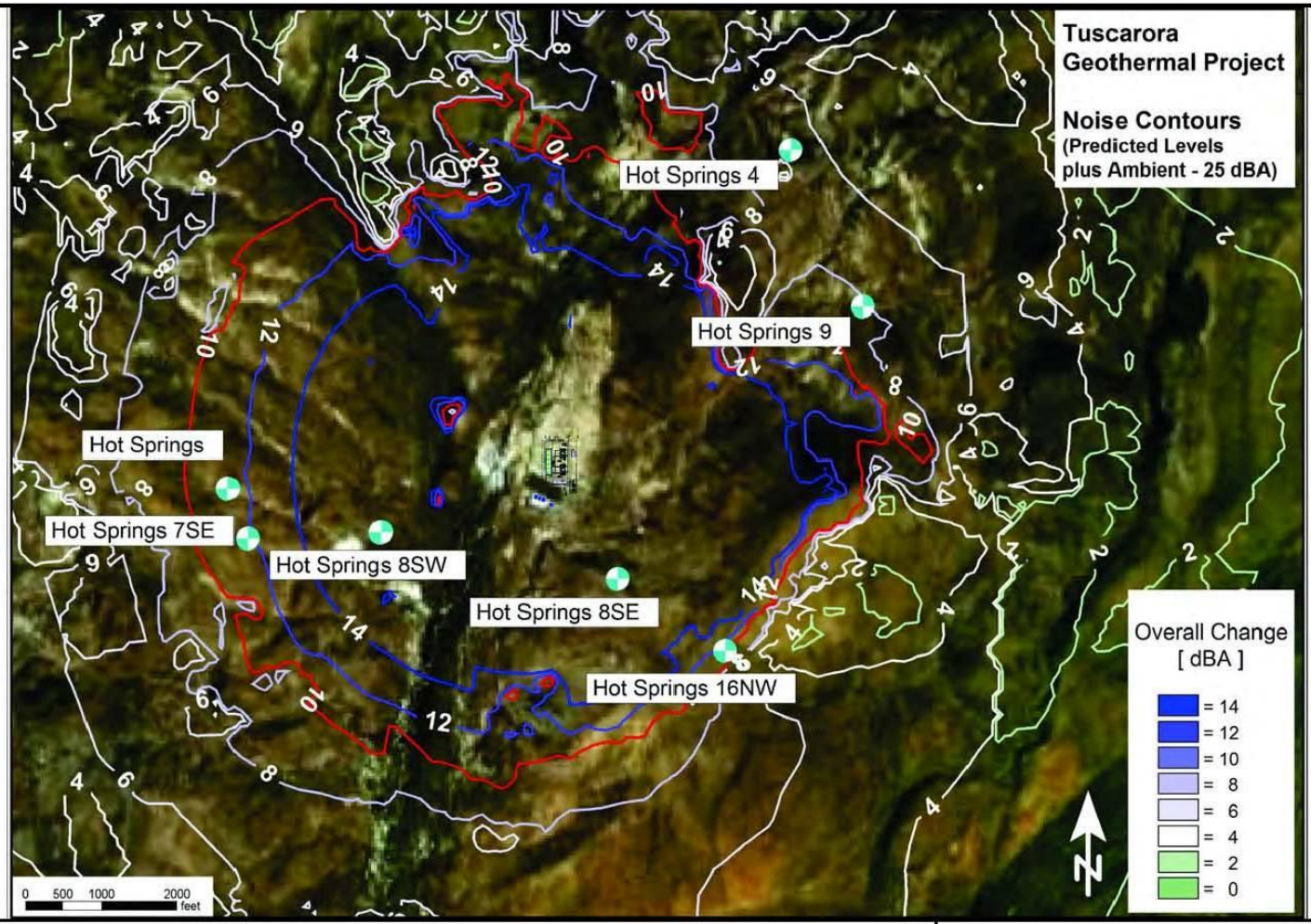
N

ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 10 TUSCARORA FACILITY
SAGE-GROUSE LEK LOCATIONS

DRAWN BY	CHJ	DATE DRAWN	6/21/2011
SCALE	1 in = 4,000 feet		

File Path: P:\X Drive\ELKO_Office\B A10358.00 _Ormat_HSSII_EA_& Baseline\EA\June_2011_Revisions



ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL
POWER PLANT PROJECTS

FIGURE 11
NOISE LEVEL CONTOURS

DRAWN BY CHJ

DATE DRAWN 6/22/11

SCALE

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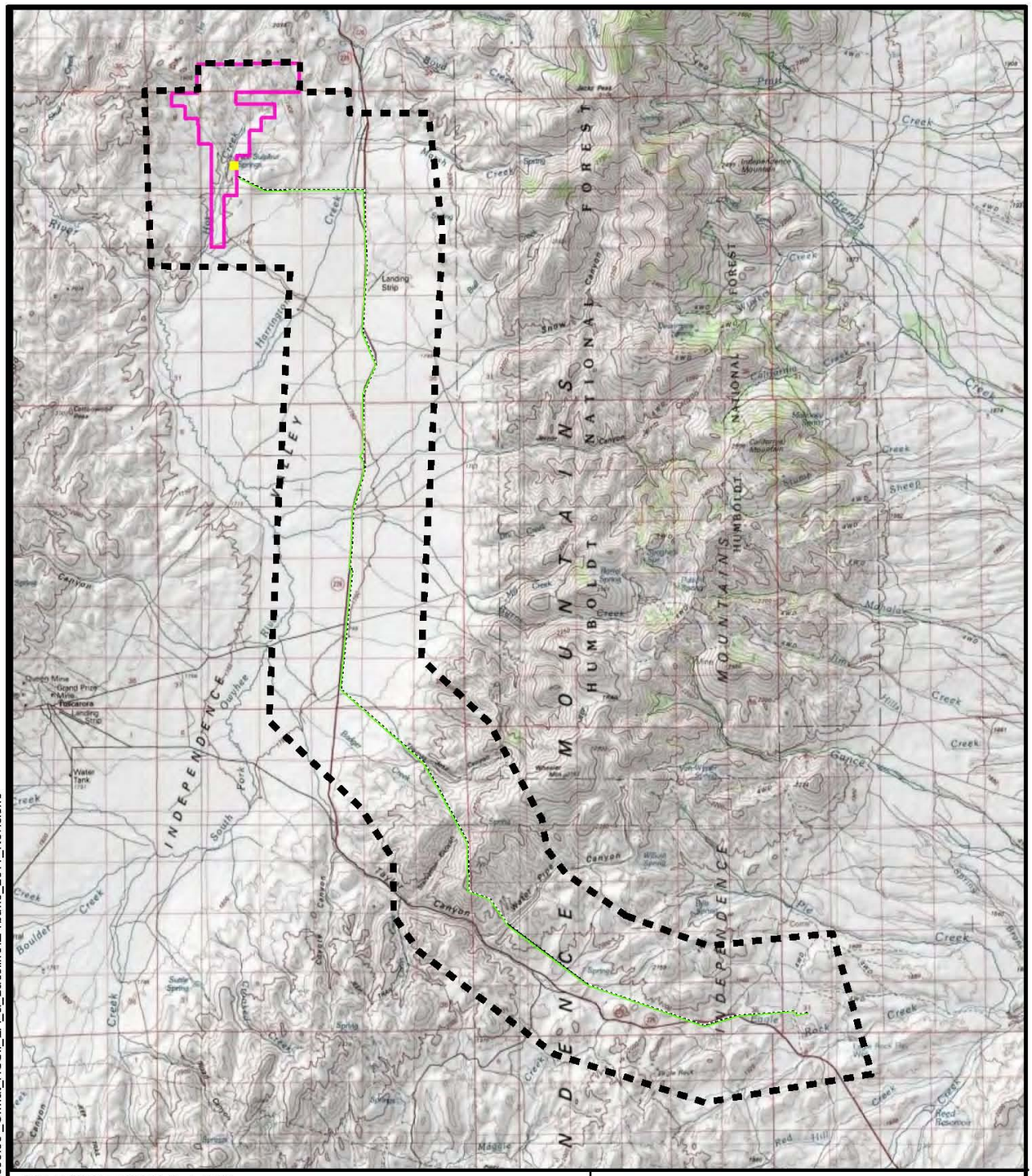


BASE :USGS 1:100,000 Scale DRGs

Project Site

CESA Boundary

Power Plant

Transmission Line

2.5 1.25 0 2.5

Miles

N

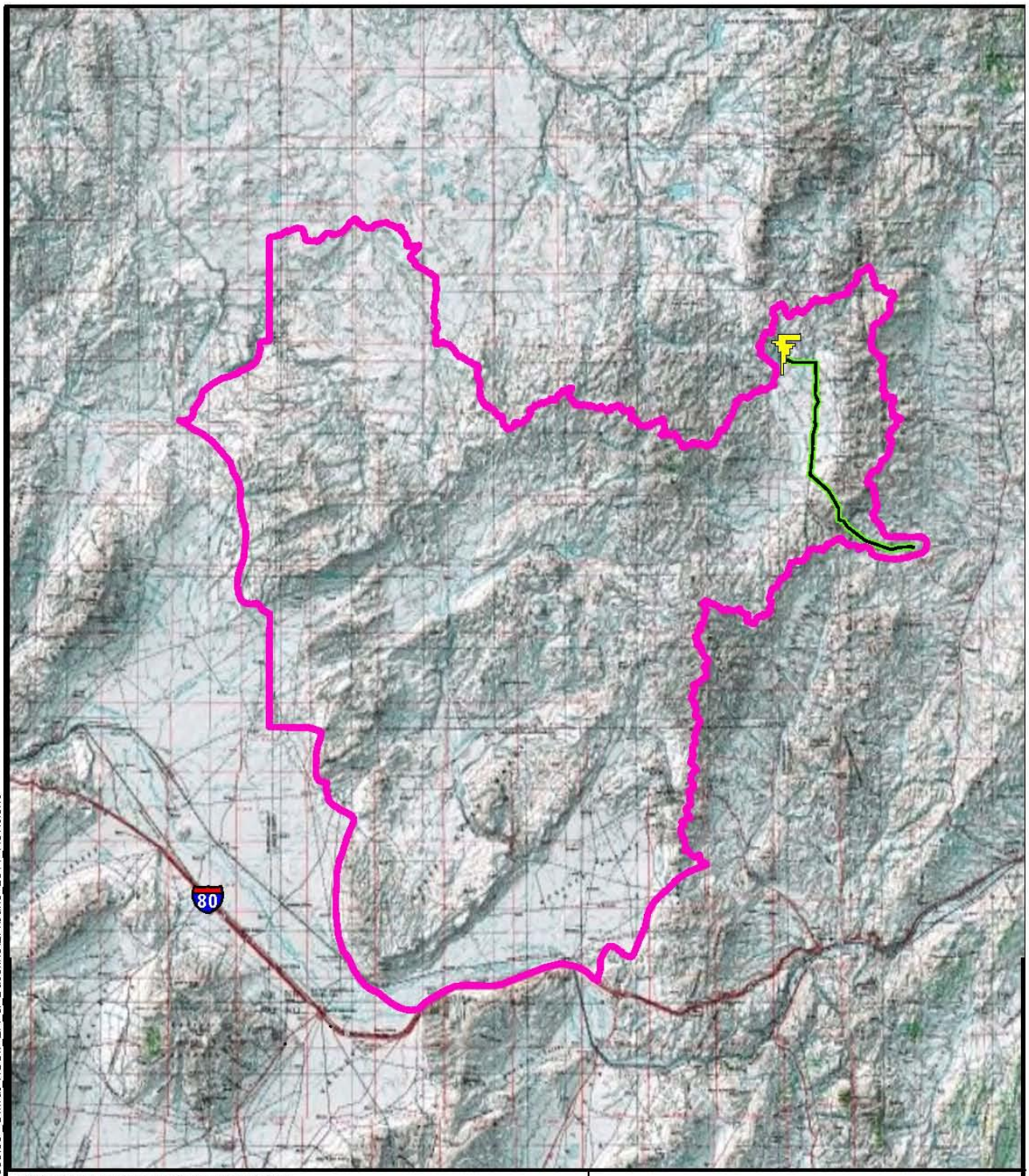
ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 12
CULTURAL RESOURCES CESA

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 3 miles

File Path: P:\X Drive\ELKO_Office\B.A10358.00 _Ormat_HSSII_EA_&_Baseline\EA\June_2011_Revisions



BASE : National Geographic Topographic Map

Project Site

CESA Boundary

Transmission Line

12 6 0 12

Miles

N

ORMAT NEVADA
NORTHERN NEVADA GEOTHERMAL POWER PLANT PROJECTS

FIGURE 13
TES SPECIES CESA

DRAWN BY	DATE DRAWN
CHJ	6/21/2011

SCALE 1 in = 12 miles

File Path: P:\X Drive\ELKO_Office\B A10358.00_Ormat HSSII_EA & Baseline\EA\June 2011 Revisions

APPENDIX A

Greater Sage-Grouse Conservation Measures Implementation Plan

Contents

A.1 BACKGROUND AND ADMINISTRATION

Background

Greater sage-grouse (*Centrocercus urophasianus, sage grouse*) use of the Project area has been documented through field surveys (JBR 2010, Nevada Department of Wildlife [NDOW] 2011), observational records (Elko District Office 2010), and telemetry data collection (NDOW 2011, Dyer 2005). Suitable habitat exists throughout and around the Project area for all seasonal uses (i.e. winter, lek/breeding/nesting, brood rearing, and fall) by sage-grouse. Predicted impacts to sage-grouse are from Project construction, testing, facility presence and maintenance of the power generation facilities, wells, power lines, pipelines, increased human activity, and increased noise.

The following conservation measures have been developed to offset the anticipated Project effects to greater sage-grouse. Overall, it is expected that implementation of the following measures will improve or enhance lesser quality habitats R1 to R4 to moderate the changes created by construction of the Project. Successful implementation and assessment of the conservation measures are dependent upon implementation of the noise and sage-grouse monitoring protocols. Other components that will be key to the success of the conservation measures will be the establishment of a Conservation Trust Fund and a Wildlife Working Group (WWG).

Administration

A Conservation Trust Fund will be established by ORMAT in cooperation with the BLM and be dedicated to the Tuscarora Geothermal Project within 30 days of the signing of the Right-of-Way for the associated Transmission Line. The trust fund should be an interest bearing account to buffer the devaluation of the 2011 conservation dollars being utilized into the future. Initiating funds will be supplied by ORMAT by calculating the monetary value of the agreed upon conservation acreages using the $600 per acre valuation as supplied in the 2010 Nevada Energy and Infrastructure Standards to Conserve Greater Sage-Grouse.

A Wildlife Working Group (WWG) should be made up of representatives from ORMAT, BLM, USFWS, and NDOW with other pertinent members being invited as needed. This oversight group will evaluate monitoring, confirm thresholds, develop habitat enhancement projects and evaluate any adaptive management that may be necessary in the implementation of this conservation plan.

All National Environmental Policy Act requirements, BLM policies, clearances and guidelines, including Section 106 of the NHPA, Native American Consultation, Endangered Species Act (ESA) and Special Status Species (SSS) habitat management guidelines and the 2001 Migratory Bird Executive Order will be completed and/or complied with prior to implementation of any sage-grouse habitat restoration or conservation measures projects.

A.2 CONSERVATION MEASURES FOR SURFACE DISTURBANCE ASSOCIATED WITH THE GEOTHERMAL POWER PLANT AND TRANSMISSION LINE

Key Issues for Sage-Grouse

Impacts to sage-grouse include the loss of 84.5 acres of sage-grouse foraging and nesting habitat, including potential Category 1 habitat as defined by Nevada's Governor Sage-Grouse Conservation Team (NGSCT, 2010), resulting from direct and/or long-term surface disturbance associated with Project construction and operation. Effects of habitat fragmentation from this habitat loss would be concentrated around the plants, production and injection pipelines, and wells.

Conservation Funding Determinations

ORMAT will voluntarily fund, at a 6:1 ratio (NGSCT 2010) at $600 per acre, terrestrial habitat enhancements and rehabilitation to compensate for disturbance in sage-grouse habitat in the vicinity of the Project (Figure 1). ORMAT will fund all enhancement projects to BLM specifications, following all WWG requirements.

At a 6:1 ratio, this equates to 507 acres (6 x 84.5 acres) of habitat conservation, improvement or protection, or a combination, thereof. The potential or likely treatment areas to be restored include BLM managed lands in vicinity of the Project area. These potential treatment areas will be identified on a case-by-case basis, based on field inventory of habitats, conditions, and potential value to sage grouse as indicated by monitoring results. Preference will be given to areas in close proximity to the Project, but outside the zone of influence, minimizing any indirect effects of the Project. Enhancement efforts can be identified in habitats that benefit any of the sage-grouse life cycles (lek, nesting, brood-rearing, and fall/winter). Habitat treatments will be prescribed for specific sites based on the probability of success and the degree of benefit to the local sage-grouse population. The determination of where a specific project is located and when work would be conducted would rest with the Wildlife Working Group.

Conservation Fund Goals

Goals of these habitat enhancement projects will be based on habitat requirements for sage-grouse. Examples of these requirements (with variability based on vegetation types and ecological site potential), are: breeding habitats 15-25% sagebrush canopy cover, greater than or equal to 15% grass cover and greater than or equal to 10% forb cover from a diverse group of forbs, also a perennial herbaceous cover with greater than or equal to 18 cm in height. In winter habitat areas, the sagebrush canopy cover should be 10 to 30% with heights of 25-35 cm (Connelly et al. 2000). Additional guidelines from the Western Association of Fish and Wildlife Agencies (WAFWA) (Connelly et al. 2000) may be used in conjunction to those outlined above.

Habitat projects could be completed in R-1, R-2, R-3, or R-4 value habitats (NGSCT 2010). These R-values are restoration habitats defined from the "Energy and Infrastructure Development Standards to Conserve Greater Sage-Grouse Populations and Their Habitats in Nevada" produced by the Nevada Governor's Sage-Grouse Conservation Team 2010 and listed below:

- "R-1 – Habitat areas that currently lack sufficient sagebrush and are currently dominated by perennial grasses and forbs, yet have the potential to produce sagebrush plant communities with a good understory composition of desired grasses and forbs.
- R-2 – Existing sagebrush habitat areas with insufficient desired grasses and forbs in the understory to meet seasonal needs of sage-grouse.
- R-3 – Sagebrush habitat areas where pinyon-juniper encroachment has affected the potential to produce sagebrush plant communities that provide adequate cover and forage to meet the seasonal needs of sage-grouse.
- R-4 – Habitat areas that have the potential to produce sagebrush plant communities, but are currently dominated by annual grasses, annual forbs, or bare ground."

Conservation Fund Measures

Measures may include, but will not be limited to, the following:

- Burn restoration (historic burns) including: seedings (sagebrush and understory vegetation via broadcast, broadcast and harrow, drill or hand seeding of seedlings), noxious and invasive plant treatment (Plateau® for cheatgrass and other herbicides as needed for other invasive and/or noxious weed species), and possible temporary fencing to protect areas of restoration. Meadow restoration or enhancement project will be given a preference for implementation.
- Brush thinning via mechanical, herbicide or hand thinning followed by seeding (seeding to be done via broadcast or drill methods) to increase the diversity in monotypic sagebrush habitat. Interseeding efforts on existing crested wheatgrass seeding areas. The intention of the treatments would be to reduce the amount of crested wheatgrass and re-establish a variety of native grass and forb species to improve the ecological diversity of the plant community with emphasis on sage grouse habitat improvements.
- Mechanical or hand shrub thinning or green stripping to reduce fuels and fire risk to sage-grouse habitats followed with successful seeding (seeding to be done via broadcast or drill methods).
- Weed treatment followed with successful seeding (seeding to be done via broadcast or drill methods).

- Retrofit existing power lines with predatory bird anti-perching measures.
- Retrofit existing power lines with flight diverters.
- Modify and mark livestock control fencing on prioritized (e.g. on or near lek, brood-rearing or fall/winter habitat areas) BLM project fences or landowner-approved private fences to reduce the potential for sage-grouse collisions while in flight or minimize the potential for predatory bird perch sites.
- In order to protect the restored habitat, temporary fencing may be used. Once restoration objectives, as identified above, are achieved, these fences will be removed.
- Funds created from this conservation measure that are held in the Conservation Trust Fund will be available for land acquisitions or easements if deemed appropriate by the WWG.
- Funds created from this conservation measure that are held in the Conservation Trust Fund may be used to compensate any willing livestock operator for deferring their grazing right to enclosed habitat enhancement projects by temporary fencing.

Monitoring

Implementation of the above 6:1 land treatment funding would be a requirement of the BLM approval of ORMAT's application for a Right-of-Way associated with the Tuscarora Geothermal Project. BLM, NDOW and ORMAT agreed that the loss of 84.5 acres of sage-grouse habitat will require 6:1 replacement (by enhancement and/or rehabilitation) of that lost habitat. The trigger points for implementation and location of habitat restoration projects will be based on monitoring (see section A.8) and identified impacts of the implemented project.

Effectiveness

These measures will improve sage-grouse habitat to substitute and offset the habitat lost through Project development and operation. Increasing the quality and the area of sage-grouse habitat in the area will be a benefit to not only individuals but to the local population as a whole.

Restoring burned areas will, in time, return those areas previously lost to sage-grouse habitat, Without sagebrush in these areas, the birds are less likely to utilize or, at best, will have limited use of the burned areas. Increasing the quality of the habitat through sagebrush and understory seedings, would permit individuals birds to once again utilize the areas in the future. Burned area reseeding of grasses, forbs and sagebrush seedlings and fencing such restoration habitat will re-establish sage-grouse habitat over time. The restored habitat will provide additional quality habitat, thus allowing sage-grouse populations to re-establish in formerly destroyed habitats.

Monotypic sagebrush habitats do not provide high valued habitat as they lack sufficient perennial understory. Breeding habitat (with vegetative variability mentioned above) should contain a sagebrush cover of 15-25% with greater than 15% for grasses and greater than 10% for forbs; winter habitat having sagebrush cover ranging from 10 to 30% (Connelly et al. 2000). By thinning sagebrush canopy cover to the desired amount and seeding the interspaces with desired native forbs and grasses, the habitat quality should increase. By green-stripping and brush thinning to create fuel breaks, the likelihood of a catastrophic fire is reduced, protecting existing and potential restored sage-grouse habitat. Successful establishment of understories and sagebrush communities over time will provide quality habitat restoration for sage-grouse and sage-grouse broods, which should ensure propagation of the local populations.

Invasive and noxious weed species reduce the health of a sagebrush stand and the quality of sage-grouse habitat. Treating these species to remove them from the area increases the quality of habitat for sage-grouse.

Modification of livestock control fencing to BLM specifications could include the reduction of the height of a fence while still retaining the intent of livestock control. Many fences have been constructed in the past, prior to BLM policy, without consideration for increased mortality risk for sage grouse and other wildlife. Sage grouse fly, at least, several feet above the ground where reduction in fence height would reduce potential for collisions. An example of a fence currently at 50-52 inches in height modified to 38-42 inches in height (BLM specs for three and four-strand fences), along with visual markers on fence wire and the top of fence posts, would reduce the risk of collision while in flight. Interim results from a study in Wyoming between 2005 and 2009 indicated that fence markers helped to reduce collisions by 61%.

Retrofitting existing power lines with predatory bird anti-perching measures will reduce the predation of sage grouse by raptors and corvids. In a small study conducted by the BLM's Kemmerer Field Office in Wyoming, researchers found no raptors on structures with perch deterrents whereas 159 raptors were documented perching on the control line (no deterrents) structures (Oles 2007).

Retrofitting existing power lines with flight diverters will reduce collisions by birds. Flight diverters on power lines would help to reduce collisions, similar to marking fences where the intent is the ability for birds to see the outline of the lines and divert their flight to avoid collision. Flight diverter use resulted in an 89% decrease in bird collisions in a study in Europe.

Conservation Measure Impacts and Constraints

ORMAT's financial contributions that ensure the sage-grouse habitat will be replaced at a 6:1 ratio will have some financial impact to ORMAT.

Any herbicide treatments for invasive and noxious weeds shall be completed within the constraints of the Extension of Weed Treatments authorized by the 1998 Environmental Assessment (DOI-BLM-NV-010-2011-0003-DNA). Vegetation reseeding using mechanical means will result in some level of soil disturbance. Appropriate clearances prior to implementation of the reseeding efforts will avoid potential impacts to other resources.

Fencing of restored/revegetated habitat, depending on the size of the project, could reduce some portion of the grazing permittee's carrying capacity. Agreements for fencing with affected permittees would be required prior to fencing such projects. ORMAT would be required to maintain all restoration project fences.

Mechanical brush thinning or green stripping would assist firefighters in reducing the size and intensities of potential wildland fire threats to existing sage-grouse habitats. Mechanical or hand thinning of brush would reduce horizontal and vertical continuity of fuel beds. Short-term loss of some habitat may occur. Soils may be disturbed if mechanical thinning occurs. Potential impacts to other resources will be reduced based on implementation of requisite clearances prior to thinning applications. Long-term protection of remaining sage-grouse habitat may occur as a result of reduced fire intensity or fire size in existing habitat.

The changes in sage-grouse habitat by increasing diversity through seeding, seedlings, plantings, etc. will improve habitat quality, reduce the potential for plant disease, and improve sage-grouse propagation and survivability. Habitat would also be improved by modification and marking of livestock control fencing to BLM specifications, retrofitting of existing power lines with predatory bird anti-perching measures, and retrofitting of existing power lines with flight diverters. These actions would help reduce unnatural "additive" mortalities associated with artificial structures and, in effect, help to increase sage grouse populations.

A.3 CONSERVATION MEASURES FOR VISUAL AND PREDATION IMPACTS ASSOCIATED WITH THE TRANSMISSION LINE

Key Issues for Sage-Grouse

The Project's proposed transmission line would be only 0.25-mile away from the Hot Springs 16NW lek, which would likely create both visual impacts (avoidance) and increased predation from raptors and corvids perching on the power lines or poles.

Conservation Measures

If within the first five years of plant operation male attendance at the Hot Springs 16NW lek drops 50% or more for two consecutive years the Operator will remove the first 8,500 feet of the transmission line nearest the power plant and replace it with underground cable by the following the lek season. Monitoring of the lek will be conducted by the Operator following NDOW

protocol (Attachment 1 to this appendix) and reported to the WWG, BLM, and NDOW. The cost of the power line removal and installation of the underground line will be held as a bond required by the terms and conditions of the Right-of-Way Grant for the Hot Sulphur Springs Transmission Line.

The Project would require implementation of a common raven monitoring and management plan as described in the following:

- During all phases of the Project (i.e., construction and maintenance), all food, waste, and trash will be placed in closed containers.
- ORMAT will prohibit employees, contractors and sub-contractors from feeding wildlife or leaving food available for scavenging wildlife.
- Road-killed wildlife on the Project site and associated travel routes will be promptly removed and disposed of in closed containers to eliminate access to ravens.
- Presence of road-killed animals will also be minimized by ORMAT's environmental protection measure of a <25 mph speed limit within the Project area.
- ORMAT has committed to implement the following environmental protection measures: perch and nest deterrents on all power poles; single pole power pole design (APLIC 2006).
- ORMAT will obtain a Raven Depredation Permit from USFWS or submit for coverage under the NDOW permit.

Monitoring
See Section A.8 for monitoring requirements.

Effectiveness
Replacing the overhead line with underground cable will remove the visual impact to the lek, and decrease the presence of avian predators within the lek vicinity, thereby decreasing the predation risk to sage-grouse.

Conservation Measure Impacts
The burying of the transmission line will result in additional project costs being incurred by ORMAT. However, since the line will be placed within the previously disturbed footprint, additional environmental impacts associated with burying the line should be minimal.

The requirement to properly collect all food, waste, and trash are BMPs and State requirements for all industrial plant operations. These are considered operating costs for ORMAT.

The prohibition of workers feeding wildlife or leaving food at the project or construction sites will limit the likelihood of attracting wildlife (e.g., common ravens and raptor species). Removal of road kill will limit the attraction of ravens, buzzards, and other carrion eating raptors such as golden eagles; thus limiting the likelihood of additional predation on sage-grouse. Speed limits proposed by ORMAT on their workers, contractors, and sub-contractors should limit accidents that may kill or maim animals.

Application of the 2006 APLIC standards should limit perching opportunities of raptors on sage-grouse. These standards should also prevent the accidental electrocution of most avian species, especially eagles and large hawks. Application of APLIC standards to transmission line facilities will be an additional financial burden to ORMAT through the purchase and use of anti-perching devices and changes in engineering design of conductors to limit potential electrocution of most avian species.

A.4 CONSERVATION MEASURES FOR NOISE, VISUAL INTRUSION, AND HUMAN ACTIVITY IMPACTS TO SAGE-GROUSE FROM GEOTHERMAL PROJECT CONSTRUCTION, TESTING, OPERATION, AND MAINTENANCE

Key Issues for Sage-Grouse

The construction and operation of the proposed geothermal plant and related activities would create noise, visual intrusion and human activity that could disturb sage-grouse during lekking season.

Conservation Measures

ORMAT will ensure that timing of shift changes and deliveries will be scheduled outside the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).

Venting pressure or steam to the atmosphere (e.g., during well or flow testing) would occur outside the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).

Construction or maintenance activities associated with well pads, pipelines, transmission lines, plant facilities, and roads will not be permitted within two miles of active leks (see Sage-Grouse Population Monitoring below) during the lekking period (15 March – 15 May, 24 hours per day).

Noise generated by the Project will be managed so that sound pressure levels will be at or below 35 dBA (ambient 25dBA plus 10 dBA) at active leks (see Sage-Grouse Population Monitoring section below) during the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).

Contingent Conservation Measures

Trigger for Contingent Conservation Measures

If noise monitoring, described in A.8 below determines noise levels at the monitored leks is greater than 35 dBA during the time period of midnight to 5 a.m. and that exceedance is due to ORMAT operations rather than natural conditions such as wind and weather, then the following actions will be taken.

Contingent Conservations Measures That May Be Implemented

- Employment of an acoustic engineer to identify and assess options to further reduce noise from Project components;
- Installation of sound damping shelters, walls, enclosures, or other barriers for pumps or other noise-producing equipment to reduce noise emitting from geothermal facilities (e.g., power plant, wellheads, turbine generator etc.);
- Reducing the amount or changing the timing of project related vehicular traffic;
- Installing poly-slats on chain link fences or other barriers around geothermal facilities to further attenuate noise emitted from those facilities.
- Sound pressure level monitoring data documenting successful reduction in dBA levels will be demonstrated and reported to the BLM within one week of the occurrence. If, after feasible attempts to reduce sound pressure levels at active monitoring leks, sound pressure levels cannot be reduced to below 35 dBA, ORMAT, BLM, and NDOW will agree on additional studies to determine whether or not further sound pressure level reduction measures will be attempted. If the studies determine that no other measures are feasible, this will end ORMAT's obligation to attempt further sound pressure level reductions.

Monitoring

Monitoring is described in section A.8.

Effectiveness

Reduction of noise, visual, and human activity disturbances associated with the Project during the lekking season at the time of day lekking occurs would reduce the disturbance on a lek. Diminished disturbance to the lek will likely lessen the chance of lower male attendance, shifting of lek locations, or loss of active lek locations.

Conservation Measure Impacts

The shift changes proposed from March 15th through May 15th may be a minor inconvenience to plant employees and operations of the facilities during these periods. There should be no financial burden to ORMAT from implementation of this mitigation.

The requirement to vent steam outside of the prescribed times may delay testing procedures for ORMAT. Since such test procedures are usually longer than twenty-four hours, ORMAT will be required to forgo such tests during the prescribed periods.
Finalization of construction and maintenance activities for well placement, pipelines, etc. are required for development of power plant and appurtenant facilities. Implementation of the above mitigation may delay full or timely facility development.

Modification of plant operations to reduce noise impacts, employment of an acoustic engineer, and installation of sound dampening barriers will increase operational costs to ORMAT. Any operational changes resulting from additional plant modifications prescribed by the acoustical engineer will also likely increase ORMAT's operational costs.

By reducing noise levels from plant operations, impacts to occupied sage-grouse leks should be reduced or eliminated, thus enabling lek activities to continue and protecting displaying males from noise disturbance.

A.5 CONSERVATION MEASURES FOR NOISE, HUMAN ACTIVITY AND HABITAT FRAGMENTATION IMPACTS TO NESTING SAGE-GROUSE FROM THE GEOTHERMAL PROJECT

Key Issues for Sage-Grouse
Project impacts to nesting sage-grouse are expected due to noise, human activity, and habitat fragmentation. The greatest impacts to nesting sage-grouse are expected during Project construction due to nest abandonment.

Conservation Measures
Nest "clearance" surveys will be conducted from March 15th to June 30th prior to any surface disturbing activities during each construction year. The area to be disturbed and a 0.5-mile radius buffer will be surveyed by a BLM approved specialist to determine if nesting sage-grouse are present. If an active nest is located, a 0.5-mile radius buffer will be placed around the nest and no surface-disturbing activities will occur until the nest is vacated.

Monitoring
Monitoring is described in section A.8.

Effectiveness
These measures will decrease the chance of nest destruction or abandonment due to construction and human activities.

Conservation Measure Impacts

By avoiding any occupied nest during construction and human activity, the likelihood of nest success may be increased; thus ensuring propagation of the local sage-grouse populations.
If nests are found by the surveys required by these conservation measures, construction delays for those aspects of the project will occur.

A.6 CONSERVATION MEASURES FOR INDIRECT EFFECTS TO SAGE-GROUSE BROOD-REARING HABITAT FROM THE GEOTHERMAL PROJECT

Key Issues for Sage-Grouse

Several springs, seeps, wet meadow, and riparian areas occur in close proximity to components of the Project. Although it is unknown to what extent these areas are being utilized by sage-grouse, any use by sage-grouse would likely be reduced or discontinued during and after Project development. The project is anticipated to impact 195 acres of brood-rearing habitat.

Conservation Measure

ORMAT will complete treatments at a 3:1 ratio (NGSCT 2010) to protect and/or restore brood-rearing habitat in targeted locations on BLM managed land near the Project. At a 3:1 ratio, this equates to 585 acres (3 x 195 acres) of habitat improvement or a funding commitment of $600 per acre, equating to $351,000. The specific areas to be treated will be identified on a case-by-case basis, determined by field inventory of habitats, conditions, and potential value to sage-grouse. Treatments will be prescribed for specific sites based on the probability of success and benefit to local sage-grouse population. The design for these projects will allow access to water for beneficial use through the use of water gaps. Placement and construction of exclosures will also need general concurrence from the appropriate permittees. ORMAT will fund all such restoration/protection projects to BLM specifications.

- Treatments may include fencing of riparian areas and meadows for protection, plantings/seedings of desired native riparian species to increase biodiversity and habitat condition, stream restoration to improve riparian areas where there are currently incised channels or nick points, and treatment of invasive and noxious weeds (e.g., salt cedar). Stream restoration may include check dams, rip/rap fortification of damaged banks and nicks, and large boulder placement within stream channels to decrease water velocity during peak flows.

- Riparian exclosures may be grazed if BLM determines that it would be beneficial to riparian health. Specifics of this grazing will be based on a return to a healthy riparian condition based on current sage-grouse guidelines and working with the local grazing permittees.

- Funds created from this conservation measure that are held in the Conservation Trust Fund may be used to compensate any willing livestock operator that is deferring their grazing right to exclosed habitat enhancement projects by temporary fencing.

- Funds created from this conservation measure that are held in the Conservation Trust Fund will be available for land acquisitions or easements if deemed appropriate by the WWG.

Monitoring
Monitoring is described in section A.8.

Effectiveness
These treatments will improve sage-grouse brood-rearing habitat to substitute and offset the habitat lost through Project development. Riparian areas and meadows are important habitat for sage-grouse brood-rearing. Having healthy riparian areas and meadows that support the native forb species and invertebrate fauna is imperative (Sveum et al. 1998). Excluding riparian areas and meadows from grazing until deemed beneficial, protects the health of those areas. Managed grazing within these exclosures may increase species diversity with desired native species valuable to brood rearing habitat.

Sage-grouse chicks require a diet high in protein that consists mainly of forbs and insects (Sveum et al. 1998), production of which is enhanced by improved riparian habitat. The cover that a healthy riparian habitat provides may reduce predation from terrestrial and avian predators on sage-grouse broods. Effectively protecting and increasing the condition of the riparian habitats provides an improved value of brood-rearing habitat.

Incised channels and nick points degrade the stream habitat and can reduce the size and health of riparian areas. Resolving those stream issues will increase the riparian health and increase the quality of the habitat.

Conservation Measure Impacts
Riparian exclosures (fences) improve riparian health, increasing diversity of desired native species and improving cover and diet for sage-grouse broods. Positive changes in stream morphology will lead to higher perennial water yields, resistance to spring flood events, and improved stream water quality.

The successful planting of seedings of desired riparian vegetation when combined with exclosure fencing will hasten recovery of vegetation, increase species diversity, and enhance the overall recovery of damaged riparian areas.

Stream channel restoration of incised channels and nicks with check dams, rip/rap fortification, and boulder placement will limit future riparian habitat loss by reducing stream bank erosion during high water events. Overtime, these structures will be silted in; preventing soil loss and decreasing nick and stream incising.

Fencing springs, seeps, meadows and riparian areas may provide perching opportunities for raptors; which may lead to some predation of sage-grouse and other animals.

A.7 CONSERVATION MEASURES FOR EFFECTS ASSOCIATED WITH THE VISUAL PRESENCE OF PROJECT COMPONENTS

Key Issues for Sage-Grouse

Human activity and visual disturbance, e.g. the geothermal plant, reflections, moving vehicles, could disturb sage-grouse during all seasons leading to avoidance of otherwise good habitat.

Conservation Measures

Where Project lighting is required, low output, motion sensor lights will be installed at facilities and must be shielded and directed to focus light only on the area requiring illumination. In addition to limiting human activity impacts to sage-grouse, such lighting will assist ORMAT in meeting the National Dark Skies initiative where ambient nighttime lighting has been identified as causing potential impacts to many wildlife species including volant species such as bats.

Non-reflective, tinted windows will be utilized in Project buildings to reduce visual disturbance.

Monitoring

Monitoring is described in section A.8.

Effectiveness

Reducing disturbance from visual and human activities will help reduce the overall impacts of the project that may induce individuals or groups of sage-grouse to abandon habitat in and near the immediate Project area.

Conservation Measure Impacts

Low output, shielded and motion sensor lights could potentially cost more than other types of lighting, increasing costs to ORMAT.

Reduced ambient light emanating from the construction sites and operational facilities of the power plant reduces visual disturbance to sage-grouse and other wildlife.

Any ambient nighttime light emanating from the facility or construction site (as compared to the current, unlighted desert setting) could cause a concentration of insects and other prey bases for bats, night hawks and other insectivores in the vicinity of the light source. Possible collisions by nighttime insectivores with construction equipment or completed plant facilities could increase, leading to volant fatalities. ORMAT would be required to report to the NDOW and the BLM any incidents of such fatalities.

Non-reflective tinted facility windows will likely be more costly to ORMAT than regular glass windows. Conversely, the likelihood of volant mortality caused by window strikes will be reduced. Solar glare will be reduced from facility windows, reducing visual disturbance to sage-grouse and other wildlife (e.g., attraction to or avoidance of the project site).

A.8 MONITORING PROTOCOLS

The following monitoring protocols will be conducted for ten lekking seasons following implementation of the Project. The protocols have been established to measure and evaluate a given parameter to analyze the Project perceived effect.

Sound Pressure Level Monitoring Within The Project Area And Zone Of Influence

The goal for sound pressure level monitoring is to ensure plant operation sound pressure levels are below 35 dBA (ambient 25dBA plus 10dBA) at receptors (lek locations). By recording daily sound pressure levels for at least one week during each lekking season, and by monitoring sage-grouse activity at lek locations each season (15March – 15 May), a determination can be made as to the adequacy of the 35 dBA level to protect sage-grouse leks (see Sage-grouse Population Monitoring below). Additionally, the WWG may evaluate the findings and recommend modification or elimination of ORMAT's sound pressure monitoring commitments if objectives have been met. During the lekking season, AM), continuous sound pressure level monitoring will be conducted from midnight to 10:00 a.m. at the active monitoring leks surrounding the Project using appropriate acoustic monitoring equipment as well as any location that is far enough away from the ORMAT geothermal plant to serve as a "control" that is subject only to natural noise. To determine seasonal lek locations, at least one lek survey would be completed prior to placement of monitoring equipment. Acoustic monitoring equipment will be placed at the lek edge closest to the Project during the afternoon (12:00 –16:00) to avoid disruption to lek activity. ORMAT is required to monitor sound pressure levels daily and report any levels of 35 dBA and above to the BLM immediately during the lekking season. Weekly reports will be filed with the BLM.

Sage-Grouse Population Monitoring Within The Project's Zone Of Influence

Annual monitoring of sage-grouse leks will be required. This includes both active leks and leks with unknown status, until leks with unknown status are determined to be inactive. Conversely,

if any unknown status leks are determined to be active, the active leks mitigation would apply. The identified active leks are Hot Springs, Hot Springs 16NW, Hot Springs 4, Hot Springs 18 and Harrington. The currently established unknown leks are Hot Springs 8SW, Hot Springs 7SE, Hot Springs 7W, Hot Springs 8SE and Hot Springs 9. Lek surveys must be completed by BLM approved biologists following standard lek survey protocol (Attachment 1) and ensure the following:

- Surveys must be conducted between 15 March and 15 May of each year. Male lek attendance is typically greatest later in the season; thus adjustments to lek survey schedules may be needed to collect accurate data.
- Surveys must be conducted at least four times per lek during the lekking season with eight days between lek visits.
- A center point of the lek activity will be recorded during each monitoring visit to document any shift in the lek location over time. The center point will be collected with a GPS unit either after lek activity has dispersed or by projecting the location using a rangefinder and compass bearing.
- Surveys must be conducted from one-half (1/2) hour before established sunrise until 10:00 AM each survey period.

To account for and evaluate annual climatic variations that may be influencing male lek attendance, the results from each of the monitored leks will be compared to the observed range of fluctuations in the following historic and trend leks outside the Project's influence. Comparison Leks will be Six mile, Willow Creek Reservoir 19 (PMU trend leks), Taylor Pass, Upper Maggie West, and Pie Creek Complex

Monitoring movements of sage-grouse at the affected leks will be conducted through radiotelemetry efforts. This monitoring will provide additional information should shifts in lek locations occur after the Project has been initiated. All efforts regarding capture and telemetry will be the responsibility of ORMAT through coordination with the BLM and NDOW. A minimum of three males and three females per targeted lek will be monitored per season for all affected leks. A minimum of one GPS radiocollar per lek per sex will be utilized. If radiocollars continue to function annually, the same males and females as previous years may be monitored. Monitoring will occur at minimum once per week during the lekking season (15 March –15 May), and once per month outside of the lekking season.

A.9 PUBLIC SEEPS AND SPRING MONITORING

Seeps, springs and associated meadows located on the public lands surrounding the Project are important sage grouse brood rearing habitats. If the Project's use of geothermal waters or other groundwater decreases the supporting flows and availability of these habitats, the dependent sage grouse would be impacted.

A monthly seep, spring and meadow monitoring protocol will be established and the Operator will monitor the flow rates of these identified surrounding seeps and springs. ORMAT will monitor the following springs in the area of the Tuscarora Facility, including the BLM Public Water Reserve (R05598) and the following springs shown on Cottonwood Peak USGS 7.5 Quad:

- NENE Sect 17 T41N R52E - this is where the public water reserve is located. UTM is approximately 4589500 North 570750 East
    - Use the most significant expression of the spring for monitoring the following:
        - NWSW Sect 9 T41N R52E
        - NESE Sect 5 T41N R52E
        - Nw1/4 of Sect 4 T41N R52E
        - NE ¼ of Sect 6 T41N R52E

- Monitoring will begin as soon as possible, but no later than 30 days after BLM approval of the ROW grant.

- Monitoring will be conducted monthly for a minimum of five years. Monitoring data will be submitted to BLM and NDOW within one week of completed measurements.

- The only known flow measurement of the PWR spring was 3 gallons per minute (gpm) in September 1982.

Trigger and Response

If the flow at the PWR drops to less than 1 gpm, ORMAT will construct a pipeline from the makeup water pipeline to the site of the PWR and use fresh water from the fresh-water cooling system sufficient to restore flow from the spring to 3 gpm. This provision will remain in effect for the lifetime of the Tuscarora Facility. Additionally should any of other monitored seeps and springs dry up ORMAT will create artificial water collection devices, termed guzzlers to offset the loss of these waters to the associated wildlife species. Meadow restoration or enhancement projects will be given a preference for implementation.

Should any of the other monitored seeps and springs dry up ORMAT will create artificial water collection devices, termed guzzlers, to offset the loss of these waters to the associated wildlife species.

Effectiveness

These measures will help ensure that sage-grouse brood-rearing habitat remains available through Project development (IM 2008-204). Riparian areas, meadows, and the waters associated with them are important habitat for sage-grouse brood-rearing. Maintaining the integrity of the dispersed waters will result in greater availability and short distances to water, which can be important for early brood rearing.

Conservation Measure Impacts

Implementation of the above conservations measures should have minimal impact to any resource, except cultural resources with the potential burying of a pipeline. Should this measure need to be implemented an archeological clearance should be conducted.

Construction of the pipeline or the guzzlers will increase operational costs to ORMAT.

A.10 REPORTING

Annual Monitoring and Survey Results Report

A report should be submitted, by ORMAT, to NDOW and BLM by June 15 of each year, for as long as the geothermal plant is operating, documenting the results from all required project monitoring (sound pressure level monitoring, sage-grouse lek and nest monitoring, spring and seep monitoring). The report should be submitted to the WWG no later than August 31 each year. Reports should include the following:

- Sound pressure level monitoring results, including daily dBA levels during the outlined lekking season and times; location (UTM, NAD83) of acoustic monitoring equipment; any isolated incidents that may have increased dBA levels temporarily
- Sage-grouse lek monitoring, including lek count data sheets, center point of sage-grouse leks (UTM, NAD83), isolated incidents disturbing sage-grouse lekking activities
- Sage-grouse radiotelemetry results
- Sage-grouse nest sites (UTM, NAD83) found during "clearance" surveys or collected opportunistically through other monitoring activities.
- Seeps and springs flow monitoring results.

- If future impact reduction measures are implemented, identification and a detailed description of the impact reduction measures and date of implementation will also be reported.

Annual Restoration Report

A report tracking the implementation of conservation measures and identification of habitat enhancement projects or charges charged to the Conservation Trust Fund will also be supplied by ORMAT by August 31 of each year to NDOW, BLM, and the WWG.

Attachment 1

Greater Sage-Grouse Lek Count Protocol

NEVADA DEPARTMENT OF WILDLIFE INSTRUCTION FOR GREATER SAGE-GROUSE LEK COUNTS

1) Arrive at the lek at least 45 minutes before sunrise.
2) Do not approach any closer than about 200 meters from the lek. This will prevent disturbance of the birds while strutting.
3) Conduct all counts between 30 minutes before sunrise and 1.5 hours after sunrise.
4) If at all possible, observe the lek from inside your vehicle. Sage-grouse are less sensitive to the approach of a vehicle and its presence than they are to you.
5) Note your arrival time and departure time on the lek count form.
6) Obtain a minimum of three counts at 15-minute intervals of each lek on each date counted. A count of males, females, and unknown birds is always preferable to a flush count.
7) In the comments section of the form, please note the following information:
    a. Wind direction and speed
    b. Temperature in degrees Fahrenheit
    c. Ground condition – dry, muddy, snow (depth in inches)
    d. Cloud cover in the following manner:
        i. Clear
        ii. Partly cloudy (less than 25% cover)

iii. Scattered (more than 25% but scattered horizon to horizon)

iv. Cloudy (more than 50% cover)

v. Foggy

8) Note the presence of predators by species, time and activity: Example – golden eagle @ 6:45 a.m. flying over lek; coyote chasing grouse at 8:15 a.m.

9) Be sure to use the common name of the lek.

NEVADA DEPARTMENT OF WILDLIFE

LEK COUNT DATA COLLECTION FORM

LEK ATTRIBUTES

LEK ID: _____ LEK NAME: _____

LEK COMPLEX: _____ TREND LEK: _____

PMU NAME: _____ PLANNING UNIT: _____

NDOW REGION: _____ UNIT: _____ BLM DISTRICT: _____

COUNTY: _____ RANGE/VALLEY: _____ LEK STATUS: _____

	EASTING	NORTHING	
GPS COORD (NAD83):	_____	_____	NEW/UPDATED: ☐

SURVEY ATTRIBUTES

OBSERVER NAME(S): _____ SURVEY METHOD: _____

TIME OF ARRIVAL: _____ SUNRISE: _____

DATE OF SURVEY: _____ TIME OF SURVEY: _____

WEATHER CONDITIONS: _____

_____

TEMPERATURE: _____

WIND SPEED: _____ DIRECTION: _____

OTHER ANIMALS AT LEK: _____

_____

LEK COUNT DATA

	COUNT 1	COUNT 2	COUNT 3	COUNT 4
MALES:				
FEMALES:				
UNKNOWN:				

HIGH COUNT MALES: _____ FEMALES: _____ UNKNOWN: _____

REMARKS:

Form Revised: March 4, 2008

APPENDIX B

Summary of Jersey Valley Facility EA

1 INTRODUCTION

1.1 SUMMARY AND LOCATION OF PROPOSED ACTION

Ormat is proposing to construct, operate and maintain the Jersey Valley Geothermal Development Project (Jersey Valley Facility). The project includes the construction and operation of a power generating facility, a geothermal wellfield, geothermal production and injection pipelines, access roads and ancillary support facilities. A 27.6-mile overhead 120 kV transmission line would originate at the proposed Jersey Valley power plant, trending north-northeast and terminating at the proposed NV Energy Bannock substation. The Jersey Valley Facility is located in the Jersey Valley geothermal unit, and encompasses approximately 8,470 acres of public and private lands.

1.2 PURPOSE AND NEED

Under the Federal Land Policy and Management Act of 1976 (FLPMA) and its implementing regulations, BLM must respond to Ormat's Right Of Way (ROW) applications, plans and programs. Under the terms of the Geothermal Steam Act, its revisions of 2007, and its implementing regulations; and the Programmatic Geothermal Environmental Impact Statement and its Record of Decision of December 2008. The BLM is also required to comply with NEPA and the Council on Environmental Quality (CEQ) regulations. BLM's need for the project is to respond to the submitted Operations Plan, Utilization Plan and FLPMA ROW applications submitted by the proponent to construct and operate the Jersey Valley Geothermal Development Project. The BLM determined that an EA would be needed to evaluate the potential environmental impacts associated with the Jersey Valley Facility and any reasonable alternatives to the proposed action, which would include a no action alternative.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 DESCRIPTION OF THE JERSEY VALLEY FACILITY

The Jersey Valley Facility is located within the Jersey Valley Geothermal Unit, and encompasses approximately 8,470 acres of public and private land. The facility would include a 30 MW power generating plant, a geothermal wellfield, geothermal production and injection pipelines, access roads, and ancillary support facilities. Other facilities at the plant site would include a laydown area, storage, fabrication areas, parking, and office trailers. Phase I of the facility would be 14 MW and the remaining MW would be added in Phase II. The discussion below covers Phase I. Since the facility is on BLM land additional NEPA analysis will be required by BLM prior to any expansion. Compliance with NEPA and other environmental conditions will also be a condition that the Department of Energy (DOE) would apply to any disbursement of funds for Phase II.

The power plant would use 17 production wells and seven injection wells. Approximately 4.72 miles of pipeline would be constructed from the production wells to the power plant and 2.85 miles of pipeline would be constructed from the power plant to the injection wells. Approximately 167 acres of temporary disturbance and 81 acres of permanent disturbance would result from development of the Jersey Valley Facility. Surface disturbance associated with the Jersey Valley Facility is summarized in Table 1.

Table 1 Summary of Surface Disturbance: Jersey Valley Facility

Description	Temporary (ac)	Permanent (ac)	Total (ac)
Wells	98.4	49.2	147.6
Pipelines	18.4	4.6	23.0
Power Plant	9.0	9.0	18.0
Access Roads	10.7	5.6	16.3
Transmission Line	14.5		14.5
Substation	5.8	5.8	11.6
Other	10.6	6.6	17.2
TOTAL	**167.4**	**80.8**	**248.2**

The facility also includes a 27.59-mile overhead 120kV transmission line. The line would originate at the Jersey Valley power plant site and terminate at the proposed NV Energy Bannock substation. The transmission line would require a 200-foot wide ROW, including a 90-foot permanent ROW and a 110-foot temporary construction ROW.

Within the Jersey Valley Geothermal Unit, approximately 4.10 miles of new access roads would be constructed. Large portions of the proposed transmission line would be constructed along existing roads and/or County-maintained roads. Portions of approximately 1,910 feet of existing roads would require improvement or construction. Approximately 1,310 feet of new road would be constructed to access the proposed substation and/or switching station. Additional details on the Jersey Valley Facility are provided in the *Jersey Valley Geothermal Development Project EA*, which is incorporated by reference in this document. (BLM, 2010)

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the affected environment and environmental consequences associated with the Jersey Valley Facility. The facility, well field, production and injection pipelines, access roads, ancillary support facilities, and transmission line would be located on private and public

property. Public land associated with this project is managed by the BLM, Mount Lewis Field Office. Public land would be impacted during the construction and operation of the proposed facility, transmission line, and access road. A more detailed description of the facility is contained in Section 2.3 of this EA. A detailed assessment of the affected environment and potential environmental consequences associated with the Jersey Valley Facility and alternatives is provided in the *Jersey Valley Geothermal Development Project, Pershing and Lander Counties, Nevada – Environmental Assessment, Battle Mountain District Office, May 2010*, which is incorporated by reference in this EA.

Several alternatives are proposed for the Jersey Valley Facility. The following sections summarize potential impacts to the environment from the Jersey Valley Facility only and do not discuss the alternatives. A discussion of the alternatives is provided in the Jersey Valley EA (BLM, 2010).

Table 2 identifies the elements (supplemental authorities) that were addressed under NEPA. Table 2 also identifies whether the Jersey Valley Facility would affect that element. For those elements that would not be affected by the Jersey Valley Facility, no further discussion in this EA is provided.

Table 2 NEPA Supplemental Authorities Relevant to the Jersey Valley Facility

Element	Present	Affected	Justification
Air Quality	Yes	Yes	Section 3.2.1
Cultural Resources	Yes	No	Section 3.2.2
Native American Religious Concerns	Yes	Yes	Section 3.2.3
Migratory Birds	Yes	Yes	Section 3.2.4
Threatened and Endangered Species	Yes	No	Section 3.2.4
Water Quality Drinking Water	Yes	Yes	Sections 3.2.8
Wetlands and Riparian Zones	Yes	Yes	Section 3.2.9
Solid or Hazardous Wastes	Yes	Yes	Section 3.2.10
Rangeland	Yes	Yes	Section 3.2.11
Environmental Justice	No	No	No minority or low income populations would be disproportionately affected
Fish Habitat	No	No	There is no fish habitat in the Jersey Valley Facility area or transmission line corridor.
Floodplains	No	No	No FEMA-designated 100-year floodplains are located near the project area.
Wild and Scenic Rivers	No	No	There are no wild and scenic rivers in the Jersey Valley Facility area or transmission line corridor.
Wilderness	No	No	There are no wilderness areas within the Jersey Valley Facility area or the transmission line corridor

Other resources of the human environment that were considered in the Jersey Valley EA and summarized in this EA are listed in Table 3.

Table 3 Other Resources Relevant to the Jersey Valley Facility

Element	Present	Affected	Justification
Wildlife	Yes	Yes	Section 3.2.4
Special Status Species	Yes	Yes	Section 3.2.4
Invasive Non-Native Species and Noxious Weeds	Yes	Yes	Section 3.2.5
Soils	Yes	Yes	Section 3.2.6
Vegetation	Yes	Yes	Section 3.2.7
Recreation	Yes	Yes	Section 3.2.12
Visual Resources	Yes	Yes	Section 3.2.13
Socioeconomic Values	Yes	Yes	Section 3.2.14
Land Use	Yes	Yes	Section 3.2.15
Areas of Critical Environmental Concern	No	No	The proposed project is not located in or near any ACECs.
Geology and Minerals	Yes	No	Geology and Minerals would not be adversely affected by the Jersey Valley Facility.
Paleontological Resources	Yes	No	The southern portion of the Jersey Valley Facility area may host supporting geologic structures for vertebrate paleontological resources. However, the project is located north of those structures.
Prime or Unique Farmlands	No	No	There are no prime or unique farmlands in the Jersey Valley Facility area.
Wild Horses and Burros	No	No	The Jersey Valley Facility area and the proposed transmission line are not located within a Herd Management Area.
Human Health and Safety	No	No	The Jersey Valley Facility area and the proposed transmission line would not threaten Human Health and Safety

Based on the information in Tables 2 and 3, the following resources were analyzed in the Jersey Valley EA (BLM, 2010) and are briefly summarized in the following sections.

- Air Quality
- Cultural Resources
- Native American Religious Concerns
- Wildlife Resources/Special Status Species/Migratory Birds
- Invasive Non-Native Species and Noxious Weeds

- Soil Resources
- Vegetation
- Water Quality and Quantity
- Wetlands and Riparian Zones
- Solid or Hazardous Wastes
- Rangeland
- Recreation
- Visual Resources
- Socioeconomic Values
- Land Use Authorizations

3.1 Air Quality

Affected Environment

Air quality in Lander and Pershing counties has been designated as "attainment/unclassified" for all standard ("criteria") air pollutants. Neither the Jersey Valley Facility area nor the transmission line corridor are located in or adjacent to any mandatory Class I federal air quality areas, USFWS Class I air quality units, or American Indian Class I air quality lands. Further discussion of this resource as it pertains to the affected environment and the Jersey Valley Facility is provided in the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Fugitive dust would be the primary pollutant of concern during construction activities. Each facility and road would be surfaced with an aggregate to minimize fugitive dusts. Additionally, best practical dust control methods would include the use of water trucks to spray water on disturbed areas on a regular basis. Combustion emissions containing criteria air pollutants, criteria air pollutant precursors, and air toxics would be released during well drilling and construction activities from the diesel engines used.

Small quantities of naturally occurring non-condensable gases, such as carbon dioxide, hydrogen sulfide, nitrogen, and methane would be emitted to the air during geothermal well testing. Additionally, small amounts of pentane would be discharged into the atmosphere. All of these releases, estimated to average about 12 tons per year, are regulated through a permit issued by the BAPC to ensure that these emissions do not result in ambient concentrations of ozone (which can be created from the reaction of ambient concentrations of hydrocarbons and NO_x) in excess of the applicable Ambient Air Quality Standards. Further discussion of this resource, as it pertains to environmental consequences and the Jersey Valley Facility, is provided in the Jersey Valley EA (BLM, 2010).

3.2 Cultural Resources

Affected Environment

Cultural resource surveys conducted in 2008 and 2009 resulted in the identification and evaluation of 99 archaeological sites, seven of which were previously recorded resources. These include 62 historic sites, 33 prehistoric sites, and four sites that contain both prehistoric and historic components. In addition to the archaeological sites, 161 isolated finds were also observed and recorded.

Seven archaeological sites are recommended eligible for listing on the NRHP, which include four prehistoric scatters. Fourteen prehistoric scatters remain unevaluated. The remaining 78 sites are recommended not eligible for listing on the NRHP. Additional information on existing cultural resources relating to the Jersey Valley Facility is provided in Section 3.3 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

All surface disturbing activities associated with the proposed project would avoid the recommended eligible and unevaluated cultural resources. A buffer of approximately 30 to 50 meters would be established around eligible and unevaluated cultural sites that lie very close to project activities. When initial construction is close to the buffered areas, an archaeological monitor would be present to insure that eligible and unevaluated cultural sites are not disturbed. As such, the proposed Project would have no impact on any archaeological sites that are either unevaluated or recommended eligible for nomination to the NRHP. Additional information on potential impacts to cultural resources is provided in section 3.3 of the Jersey Valley EA (BLM, 2010).

3.3 Native American Religious Concerns

Affected Environment

Located within the traditional territory of the Western Shoshone (and possibly some Paiute) Tribes, the BLM Mount Lewis Field Office administrative boundary contains spiritual/traditional/cultural resources, sites, and social practices that aid in maintaining and strengthening social, cultural, and spiritual integrity. Recognized tribes with known interests within the administrative boundary are the Te-Moak Tribe of Western Shoshone (Elko, South Fork, Wells, and Battle Mountain bands), Duck Valley Shoshone-Paiutes Tribe of Duck Valley Tribes of Idaho and Nevada, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Yomba Shoshone, the Timbisha Shoshone Tribe, and various other Tribal groups, community members, and individuals.

A cultural resources inventory of the Jersey Valley Facility area and transmission line corridor identified 99 archaeological sites (seven of which were previously recorded), including both historic and prehistoric resources. Of these, seven have been recommended as eligible for

inclusion on the NRHP, and 14 sites remain unevaluated due to their location in coppice dunes, with the potential to contain intact, stratified cultural deposits. In accordance with federal statute and regulations, the BLM must provide affected tribes an opportunity to comment and consult on the proposed project, and attempt to limit, reduce, or possibly eliminate any negative impacts to Native American traditional/cultural/sites, activities, and resources.

The BLM initiated consultation with the Battle Mountain Band Council, Te-Moak Tribe of Western Shoshone, Yomba Shoshone Tribe and the Duckwater Shoshone Tribe. To date, the Battle Mountain Band has been the most active and participating tribal entity with a field visit having been conducted on June 4, 2009. Communications with tribal leadership has resulted in another field tour request by the Battle Mountain Band Chairman. Additional information on existing spiritual/traditional/cultural resources, sites, and social practices is provided in Section 3.4 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Vehicles, equipment, and personnel used for planning, exploration, construction and maintenance purposes can have negative impacts to areas utilized by native peoples and associated artifacts. Long and short-term noise and visual impacts can have a detrimental impact to existing cultural/traditional/spiritual activities that may occur in certain areas. Sacred sites such as prayer, sweat lodge, medicinal/strength gathering, and edible/medicinal plant gathering locations must remain quiet and undisturbed, and a sense of reverence maintained.

Archaeological sites within or in close proximity to certain project boundaries have been known to experience various levels of degradation, thus eliminating not only the physical evidence of native occupation, but also archaeological data, which can produce a better understanding of past and present cultures. Roads leading to project activities can experience further use by members of the public to access formerly inaccessible locations. If members of the general public increasingly utilize project roads, the cultural/traditional/spiritual integrity of any adjacent Native use site may be compromised. Also, the act of drilling wells is often viewed by traditional practitioners and believers as being harmful to "mother earth" due to impacts to underground and surface waters, which are considered the "life blood of the Earth and all who dwell upon it."

Though the possibility of disturbing Native American gravesites within the Jersey Valley Facility area is extremely low, inadvertent discovery procedures must be noted. Under federal statute and regulations, the discovering individual must notify the land manager in writing of such a discovery. If the discovery occurs in connection with an authorized use, the activity must cease and the materials are to be protected until the land manager can respond to the situation. If any traditional cultural properties or artifacts are identified before or during development activities, a protective "buffer zone" may be acceptable, where physical avoidance is an issue, and if doing so satisfies the needs of the BLM, the proponent and affected Tribe. The size of any "buffer zone" would be determined by all participating entities. All NRHP-eligible and unevaluated

cultural sites identified during the cultural resources inventory would be avoided. Additional information on potential impacts to spiritual/traditional/cultural resources, sites, and social practices is provided in section 3.4 of the Jersey Valley EA (BLM, 2010).

3.4 Wildlife, Special Status Species, and Migratory Birds

Affected Environment

A biological survey of portions of the power plant site and the entire transmission line corridor was conducted in May 2008. During a survey conducted in 2009, additional areas of proposed surface disturbing activities were identified at the transmission line substation area. The BLM identified mule deer (*Odocoileus hemionus)*, bighorn sheep (*Ovis canadensis nelsoni*) and pronghorn antelope (*Antilocapra americana*) habitat as potentially occurring within portions of the Jersey Valley Facility area and/or the transmission line corridor.

A biological survey of portions of the facility site and entire transmission line corridor was conducted in May 2008, and additional areas at the transmission line substation area were surveyed in 2009. Within a five kilometer buffer around the project boundary the following special status species were identified: Lahontan beardtongue (*Penstemon palmeri* var. *macranthus*), windloving buckwheat (E*riogonum anemophilum*) and Reese River phacelia (*Phacelia glaberrima*). Habitat may also be available for the Sadas pyrg (*Pyrgulopsis sadai*) and the Dixie Valley pyrg (*Pyrgulopsis dixensis*). Surveys for burrowing owls and bats identified the ferruginous hawk (*Buteo regalis)*, prairie falcon (*Falco mexicanus)* and golden eagle (*Aquila chrysaetos)*.

Migratory birds may be found in the proposed Project area as either seasonal residents or as migrants. Species include meadowlarks (*Sturnella meglectus*), horned larks (*Eremophilia alpestris*), mourning doves (*Zenaidura macroura*), and barn swallows (*Hirunda rustica*). Red-winged blackbirds (*Agelaius phoeniceus*) and killdeer (*Charadrius vociferous*) were observed near the two spring areas within the Jersey Valley Unit Area. House finches (*Carpodacus mexicanus*) were observed and heard along the eastern Jersey Valley Unit Area boundary near the pinyon-juniper woodlands on the hill slopes. Additional information on existing wildlife, special status species, and migratory birds are contained in section 3.5 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Surface disturbance from construction activities would result in the loss of wildlife habitat. Direct displacement of wildlife would result from construction of the drilling pads, power plant site, pipelines, transmission line, switching station, and access roads. A slight reduction in wildlife carrying capacity is expected to occur for some species, but most species are expected to adjust and relocate to similar habitat that is abundant in the project vicinity. Indirect effects would be temporary and short-term for the proposed construction and drilling operations, but

would continue over the life of the Jersey Valley Facility power plant operations. Wildlife would be able to re-occupy the disturbed areas upon completion of site reclamation. No residual impacts to wildlife resources are expected.

Impacts to special status species along with proposed mitigation measures have been included in the Jersey Valley EA (BLM, 2010) along with further discussion of this resource as it pertains to the Jersey Valley Facility and environmental consequences.

Construction of the proposed project (regardless of the season constructed) would result in the direct loss of potential migratory bird habitat until reclaimed. Project construction and drilling noise could keep some migratory birds away from the project area. Indirect impacts would be temporary and short-term for construction and drilling operations, but would continue over the life of the project during power plant operations. Migratory birds would be able to re-occupy disturbed areas on completion of site reclamation. Residual impacts to migratory birds are not expected. Additional information on potential impacts wildlife, special status species, and migratory birds are contained in section 3.5 of the Jersey Valley EA (BLM, 2010).

3.5 Invasive Non-Native Species and Noxious Weeds

Affected Environment

Noxious weeds and invasive species are typically non-native plants that infest and/or invade areas where disturbance has occurred and have the ability to rapidly out-compete native vegetation for resources. They impact native ecosystems by reducing overall biodiversity, altering local hydrologic and soil characteristics, and increasing wildfire intensity. On a smaller scale, noxious weeds interfere with native plant succession by competing for pollinators, being prolific seed producers, displacing native plant species, serving as reservoirs of plant pathogens, and converting complex plant communities into simple plant communities. Noxious weed surveys were conducted in 2008. The results of those surveys and other information on existing non-native species in the project area are described in section 3.6 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

The proposed project could contribute to the spread of invasive non-native species and noxious weeds within the Jersey Valley Facility area and transmission line corridor through the proposed surface disturbing activities and the number of construction and drilling vehicles involved. ORMAT has committed to EPMs to prevent the spread of invasive non-native species and noxious weeds. These measures are outlined in section 2.1.11 of the Jersey Valley EA. Additional discussion of potential impacts from non-native species or noxious weeds is contained in section 3.6 of the EA (BLM, 2010).

3.6 Soils

Affected Environment

Soil associations in the Jersey Valley Facility area and the transmission line corridor mapped by the Natural Resource Conservation Service. A list of these soil associations as well as maps of the Jersey Valley Facility area can be found in section 3.7 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

The potential for erosion within the Jersey Valley Facility area is slight to moderate. The potential for erosion within the transmission line corridor is moderate to high. Surface disturbance and vegetation removal during construction of proposed project facilities within the Jersey Valley Facility area and transmission line corridor would increase the potential for erosion through exposure of denuded surfaces. Because the surface disturbed would be greater than five acres, a Nevada Department of Environmental Protection (NDEP) Bureau of Pollution Control Surface Area Disturbance Permit, documenting the areas of proposed disturbance and the best practical dust control methods to be used. Further discussion of potential impacts to soil resources from the Jersey Valley Facility is provided in section 3.7 of the Jersey Valley EA (BLM, 2010).

3.7 Vegetation

Affected Environment

Differences in vegetation communities are closely related to soil associations. Soils within the Jersey Valley Facility area and the transmission line corridor were mapped by the Natural Resource Conservation Service Lander County and Pershing County. Additional discussion of existing soil resources, including mapped vegetation communities within the project area, can be found in section 3.8 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Construction in Jersey Valley Facility area and transmission line corridor would result in the loss of vegetation. Approximately 86.67 acres of disturbance would be "temporary" and vegetation can be allowed to recover after construction is completed. Approximately 80.66 acres of disturbance would be "permanent" and lost over the life of the project, but would be recovered following site reclamation. Disturbed areas could experience an increase in cheatgrass compared to non-disturbed areas. Additional discussion of potential impacts to soil resources can be found in section 3.8 of the Jersey Valley EA (BLM, 2010).

3.8 Water Quality and Quantity

Affected Environment

Surface water in the Jersey Valley Facility area is limited to a few springs and associated ponds and a few west-flowing stream channels. These streams are either ephemeral or intermittent. No stream flow or water quality data is available for these streams. Five springs exist, of which one

is cold and four are geothermal. The Nevada Division of Water Resources (NDWR) also lists eight points of diversion for surface water rights located within the Jersey Valley Facility area.

Several groundwater wells exist within the Jersey Valley Hydrographic Area, one of which is owned by the BLM. Nine existing geothermal exploration wells were drilled in 1981 and 1982. Samples of geothermal fluid from several of the geothermal wells were collected and analyzed during exploration of the Jersey Valley Facility area. These geothermal fluids are sodium chloride/calcium sulfate water, but with a substantially higher total dissolved solids concentration (approximately 2,600 parts per million).

The NDWR lists eight points of diversion for surface water rights located within the Jersey Valley unit area. One of these is a certified irrigation right from a stream source on private land. The remaining seven are vested stock water rights totaling from springs that are associated with the Jersey Hot Springs. Additional information on existing surface and groundwater resources can be found in section 3.9 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Geothermal wells would be drilled using non-toxic drilling mud to prevent the loss of drilling fluids and minimize the risk of contamination to any aquifers. Because non-toxic drilling mud would be used, contamination of the local ground water aquifers as a result of the temporary discharges into the reserve pits is unlikely.

Over the operational life of the project, accidental discharges of geothermal fluids could contaminate surface or ground waters. Contamination of surface or ground water from spills of petroleum projects (such as diesel fuel or lubricants) is unlikely because the well pads and power plants sites, where most petroleum products would be used and stored, would be bermed to contains and control any spills. Monitoring requirements are discussed in section 3.9 of the Jersey Valley EA (BLM, 2010).

During construction, the Jersey Valley Project would consume about 105 acre-feet of ground water over the anticipated 12-month construction period, principally for geothermal well drilling and dust control. This one-time quantity of construction water, obtained from existing private water well source, is substantially less than the perennial yield estimated for the basin. Thus, there is little potential for creating any adverse affects on the quantity of either surface waters or ground waters in or adjacent to the geothermal operations area. The following monitoring measure is proposed for the Jersey Valley project to verify the absence of adverse effects on the quantity and quality of ground water. Additional information on impacts to surface and groundwater resources can be found in section 3.9 of the Jersey Valley EA (BLM, 2010).

3.9 Wetlands and Riparian

Affected Environment

The Jersey Valley Facility area contains two spring areas. Both springs appeared to be perennial based on the vegetation at each site. No perennial streams were observed in the project area. Total riparian vegetation within the Jersey Valley Facility area is approximately nine acres. No springs, riparian areas, or wetlands were identified in the transmission line corridor. The corridor crossed several ephemeral drainages, but none were conveying any surface flow during the survey. Additional discussion of wetland and riparian resources is provided in section 3.10 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Because no surface disturbing activities are proposed within any riparian area, there would be no direct impacts to riparian vegetation. Because geothermal lease stipulations direct that adverse impacts to springs are not allowed, indirect impacts to the associated riparian vegetation are not anticipated. Additional discussion of potential impacts to wetland and riparian resources is provided in section 3.10 of the Jersey Valley EA (BLM, 2010).

3.10 Solid or Hazardous Wastes

Affected Environment

There are no hazardous material storage facilities in the Jersey Valley Facility area or transmission line corridor, nor are hazardous materials known to be routinely used. The transport and handling of hazardous materials in Nevada are subject to numerous federal and state laws and regulations. Additional discussion of existing conditions related to solid and hazardous materials is provided in Section 3.11 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Diesel fuel, lubricants, hydraulic fluids and drilling chemicals (drilling mud, caustic soda, barite, etc.), would be transported to, stored on, and used by the project at the proposed drill sites. The project must conform to both federal and state requirements for handling these hazardous/regulated wastes materials. Typical of most construction projects, the storage and use of these materials may result in minor, incidental spills of diesel fuel or oil to the ground during fueling of equipment, filling of fuel storage tanks, and handling lubricants. Other incidental spills could be associated with equipment failures such as ruptured hoses. The project includes hazardous material spill and disposal contingency plan, which would describe the methods for cleanup and abatement of any petroleum hydrocarbon (including petroleum contaminated soils) or other hazardous material spill. Additional discussion of potential impacts related to solid and hazardous materials is provided in section 3.11 of the Jersey Valley EA (BLM, 2010).

3.11 Rangeland

Affected Environment

The Buffalo Valley Allotment, South Buffalo Valley Allotment and Jersey Valley Allotment are within the transmission line corridor. The Buffalo Valley and South Buffalo Allotments, combined, comprise 388,639 acres and support 13,135 animal unit months (AUMs) during the year (approximately 30 acres per AUM). An AUM is the amount of forage needed to sustain one cow, five sheep or five goats for a month. Range improvements in the project area include a number of fences and the Cow Creek Pipeline. Further discussion of existing rangeland resources is provided in section 3.12 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

The Jersey Valley Facility could disturb up to 166.28 acres of rangeland resources. This disturbance could result in a reduction of 10 AUMs within the allotment, or less than one percent of the AUMs within the combined allotments. Project activities would not prevent livestock access to available sources of water in the area. Therefore, no impacts to range resources are expected. Further discussion of potential impacts to rangeland resources is provided in section 3.12 of the Jersey Valley EA (BLM, 2010).

3.12 Recreation

Affected Environment

Known dispersed recreational use in the Jersey Valley Facility area includes the soaking facility constructed downstream of the hot springs. In the transmission line corridor, recreation use is low and primarily associated with dispersed driving for pleasure, hunting, wildlife viewing and off-highway vehicle (OHV) use. Further discussion of existing recreation resources is provided in section 3.13 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

The closest project activity to the soaking facility is well site 17-28 and the associated production pipeline. Because these project components are more than 0.25 miles from the soaking facility, no impacts are anticipated. Because the project would have no affect on the quality or quantity of surface or ground waters, there would be no impact on the ability of recreational users to access or utilize the hot springs. Further discussion of potential impacts to recreation resources is provided in section 3.13 of the Jersey Valley EA (BLM, 2010).

3.13 Visual Resources

Affected Environment

The BLM initiated the visual resource management (VRM) process to manage the quality of landscapes on public land and to evaluate the potential impacts to visual resources resulting from development activities. There are four levels (Classes I, II, III, and IV). Class I is the most restrictive and Class IV is the least restrictive. The entire Jersey Valley Facility area and

proposed transmission line corridor are located in a VRM Class IV area. Further discussion of existing visual resources is provided in the Jersey Valley EA (BLM, 2010).

Environmental Consequences

During the 45-day drilling operations, the drill rig may extend to a height of 175 feet above ground level. These operations would operate 24-hours per day, 7 days per week. During drilling operations, the rig would be visible at distances of greater than one mile from the respective drill sites, and lights used when drilling at night would increase rig visibility. Impacts to visual resources from drilling operations would primarily affect the elements of line and color. Drilling operations would be temporary and short-term. Further discussion of potential impacts to visual resources is provided in the Jersey Valley EA (BLM, 2010).

3.14 Socioeconomic Values

Affected Environment

The closest population center to the project area is Battle Mountain in Lander County. Adjacent population centers/counties are Lovelock in Pershing County and Winnemucca in Humboldt County. Demographic data on existing population, housing, income and employment are presented in section 3.15 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

Construction of the well field, pipelines and power plant within the Jersey Valley Facility was expected to require 50 workers and anticipated to last approximately 12 months. Construction of the transmission line, switching station, and laydown areas is expected to require from 25 to 30 workers and last approximately six months. Although some of these workers would be recruited locally, most would be specialized workers from outside of the local area.

Operation of the facility is expected to require 20 workers, and would not induce population growth in an area. The Jersey Valley Facility would not require or provide any infrastructure that would indirectly induce substantial population growth. Further discussion of potential impacts to socioeconomic conditions is provided in section 3.15 of the Jersey Valley EA (BLM, 2010).

3.15 Land Use Authorizations

Affected Environment

Several rights-of-way have been granted by the BLM on the public lands within the Jersey Valley Facility area and transmission line corridor, and generally consist of rights-of-way for power lines, telephone lines, access roads, and pipelines. In addition, a public water reserve (PWR 107) and several authorizations for fences and a pipeline are located within the Jersey Valley Facility area. Additional details on existing land use authorizations are provided in Section 3.16 of the Jersey Valley EA (BLM, 2010).

Environmental Consequences

All project activities within the Jersey Valley Facility area are located away from authorized rights-of-way. Transmission line poles would not be located within any existing rights-of-way and no impacts are expected. Transmission line wires would pass over several authorized lands, but would not interfere with any existing rights-of-way. Therefore, no impacts to lands and realty within the geothermal operations area are anticipated. Additional information on potential impacts to land use authorizations are provided in section 3.16 of the Jersey Valley EA (BLM, 2010).

4.0 CUMULATIVE EFFECTS

This section summarizes the cumulative effects analysis for the Jersey Valley Facility, which is contained in the *Jersey Valley Geothermal Development Project, Pershing and Lander Counties, Nevada – Environmental Assessment, Battle Mountain District Office, May 2010,* and which is incorporated by reference in this EA. Based on the analysis of potential environmental consequences the Jersey Valley EA concluded that the following resources were appropriate for the assessment of cumulative effects:

- Air Quality
- Rangeland
- Native American Religious Concerns
- Solid or Hazardous Wastes
- Water Quality and Quantity
- Soils
- Invasive Non-Native Species and Noxious Weeds
- Vegetation
- Wildlife/Special Status Species/Migratory Birds
- Recreation
- Visual Resources
- Socioeconomic Values
- Land Use Authorizations

The past, present, and reasonably foreseeable actions (RFFA) that would contribute to cumulative impacts in the CESA include livestock grazing, recreational activities, transportation and access, wildland fires, wild horse and burro use (including wild horse gathers), mineral exploration, geothermal exploration, a pending FLPMA land sale, a pending access road ROW, a pending Plan of Operations, and mining. A description of these activities is provided below.

Livestock Grazing

Portions of seven BLM-managed grazing allotments are within the CESA: North Buffalo, South Buffalo, Jersey Valley, Home Station Gap, Pumpernickel, Copper Canyon, Cottonwood and Carico Lake (BLM, 2010). In order to support the management of these allotments, a variety of

range improvement projects have been implemented through the years, including fences, cattle guards, and wells.

Recreational Activities

Dispersed recreation occurs within the Cumulative Effects Study Area (CESA) and includes OHV use, wildlife viewing, and hunting.

Transportation and Access

Past and present actions within the CESA are supported by a transportation system, which includes gravel county roads, BLM roads, and dirt roads or "two-track" roads on public lands. Few of these roads are regularly maintained.

Wildland Fires

Within the past decade there have been seven wildland fires within the CESA: two unnamed fires (1999 and 2000), the Gooseberry Fire (2001), Smelser Pass Fire (2006), Cottonwood Fire (2006), Buffalo Ranch Fire (2006), and the Horse Fire (2007) (BLM, 2010).

Wild Horse and Burro Use

Portions of two BLM-managed Herd Management Areas (HMAs) are within the CESA: Tobin Range HMA and the Augusta Mountains HMA (BLM, 2010).

Mineral Exploration

Hundreds of active mining claims exist within the CESA.

Geothermal Exploration

ORMAT has conducted geothermal temperature gradient hole and geothermal observation well drilling activities within the Jersey Valley Facility area.

Pending Land Sale

A FLPMA land sale is pending. The proponent of the land sale is Buffalo Valley Farms. The sale involves approximately 7,370 acres located in Sections 1-3, T30N, R40E and Sections 11, 14, 15, 22, 23, 25-27, 34, and 35, T31N, R41E. This land sale has been pending since April 2004.

Access Road ROW

An access road ROW is pending. The proponent is the Lander County Public Works Department. The ROW is approximately 4.5 acres and would be located in Sections 6 and 18, T30N, R43E and Section 32, T31E, R43E. This access road ROW has been pending since October 2007.

Plan of Operations

A mining Plan of Operations is pending. The proponent is Independence Gold. The Plan of Operations involves 50 acres of surface disturbance and is located at Section 33, T31N, R43E. The plan has been pending since December 2005.

Mining

The BLM has been apprised of a potential hard rock mine development located in the CESA. This mine is anticipated to disturb approximately 900 acres. The anticipated mine life is ten plus years.

The Jersey Valley Facility CESA is defined differently for each resource addressed in the cumulative effects analysis. The following sections contain descriptions of activities that have occurred and may occur in the reasonably foreseeable future within the identified CESA boundaries, and an analysis of the potential cumulative effects. The Jersey Valley Facility CESA is approximately 407,360 acres in size, and is based on hydrologic and topographic boundaries.

4.1 Air Quality

Past and present actions have generated fugitive dust, principally from surface disturbing activities and travel on unpaved roads. Fugitive dust would be generated by the many of the activities within the CESA including the Jersey Valley Facility. The increased fugitive dust emissions would vary depending on a variety of factors. The cumulative effects of fugitive dust emissions from the Jersey Valley Facility, when mitigated by implementation of EPMs, would be minimal.

4.2 Rangeland

Increased disturbance of vegetation and soil are primary impacts likely to result from the Jersey Valley Facility. However, the contribution of the Jersey Valley Facility to the cumulative effects of grazing would be minimal. Cumulative effects would be further reduced when reclamation activities commence.

4.3 Native American Religious Concerns

Vehicles, equipment, and personnel used for planning, exploration, construction, and maintenance purposes can have negative impacts to areas utilized by native peoples and associated artifacts. Long- and short-term noise and visual impacts can have a detrimental impact to existing cultural/traditional/spiritual activities that may occur in certain areas. Sacred sites such as prayer, sweat lodge, medicinal/strength gathering, and edible/medicinal plant gathering locations must remain quiet and undisturbed, and a sense of reverence maintained. Archaeological sites within or in close proximity to certain project boundaries have been known to experience various levels of degradation, thus eliminating not only the physical evidence of native occupation, but also archaeological data, which can produce a better understanding of past and present cultures. Roads leading to project activities can experience further use by members

of the public to access formerly inaccessible locations. If members of the general public increasingly utilize project roads, the cultural/traditional/spiritual integrity of any adjacent Native use site may be compromised. Also, the act of drilling wells is often viewed by traditional practitioners and believers as being harmful to "mother earth" due to impacts to underground and surface waters, which are considered the "life blood of the Earth and all who dwell upon it."

4.4 Solid or Hazardous Wastes

Hazardous materials associated with the Jersey Valley Facility are typical of many mining and industrial activities in the region. Typical of most construction activities, the storage and use of these materials may result in minor, incidental spills of diesel fuel or oil to the ground during fueling of equipment, filling of fuel storage tanks, and handling lubricants. Other incidental spills could be associated with equipment failures such as ruptured hoses.

Materials stored on-site during normal power plant operations include diesel fuel for the fire pump and standby generator, lubricating oils, and small quantities of paint, antifreeze, cleaning solvents, battery acid, transformer insulating fluid, and laboratory reagent chemicals. Air pollution abatement chemicals and geothermal fluid handling chemicals would also be stored on-site. These materials are typically stored in secondary containment to minimize the potential for adverse effects from spills or releases.

Proper handling, storage, and disposal of these hazardous materials, hazardous/regulated wastes and solid wastes by all activities in conformance with federal and state regulations would minimize soil, groundwater, or surface water contamination and the cumulative effects associated with these materials.

4.5 Water Quality and Quantity

Over the operational life of the Jersey Valley Facility, as with similar projects, accidental discharges of geothermal fluids could contaminate surface or ground waters. Impacts to water quality could be expected to occur from additional mineral exploration and other activities within the CESA. Risks of those events can reduced with frequent inspections and ultrasonic monitoring and testing of geothermal pipelines. Contamination of surface or ground waters from spills of petroleum products can be further minimized by placing well pads, power plants, and other facilities that store petroleum products in bermed containment areas. These and other measures, such as spill and disposal contingency plans, can help to minimize the cumulative effects of these and similar activities throughout the CESA.

4.6 Soils

Additional impacts to soils could be expected to occur with future mineral exploration and other activities within the CESA. Additional roads could be constructed and mineral exploration holes drilled. Each of these activities would disturb the soils in the affected areas, which would be "lost" until reclaimed following completion of the project. Mitigation measure(s) requiring the

salvaging of topsoil could help reduce potential cumulative effects if implemented for the Jersey Valley Facility and other similar actions.

4.7 Invasive Non-Native Species and Noxious Weeds

The Jersey Valley Facility, along with other past and present actions, have the potential to introduce and contribute to the spread of invasive non-native species and noxious weeds (seed and vegetative plant parts) within the CESA, and the same may be expected from the RFFAs. Ongoing mineral exploration activities would cause the most extensive surface disturbance and would present the greatest opportunity for invasive non-native species and noxious weed introduction and proliferation. Use of accepted best management practices would help to minimize the cumulative effects associated with these actions.

4.8 Vegetation

Current and future activities would disturb and/or remove vegetation in the CESA. Mitigation measure(s) requiring timely reclamation and re-seeding of disturbed areas, as proposed by the project, would reduce impacts to vegetation. With mitigation measures and the use of best management practices, the contribution of the Jersey Valley Facility to cumulative effects on vegetation would be minimal.

4.9 Wildlife/Special Status Species/Migratory Birds

Wildlife habitat could be disturbed by the additional mineral exploration activities and activities proposed under the Plan of Operations and through the creation of roads and other surface disturbing activities associated with the RFFAs. The combined amount of this direct and indirect surface disturbance from the Jersey Valley Facility and similar projects constitutes a small portion of the CESA. Mitigation measures, BMPs, and reclamation of disturbed areas, as proposed by the project, could reestablish habitat for wildlife and contribute to the long-term reduction of cumulative effects to wildlife.

Activities associated with RFFAs would closely regulated in areas where there would be a potential negative impact on special status species. Implementation of mitigation measures, as identified for the Jersey Valley Facility, could help to reduce the potential for adverse effects if also implemented for the other actions.

The amount of surface disturbance that may be created by RFFAs, and possibly effect habitat for migratory birds, would constitute a very small portion of the CESA. Mitigation measures requiring inventories of migratory bird nests and limiting ground disturbing activities would help to reduce potential adverse effects. With these measures in place, cumulative effects on migratory birds are expected to be minimal.

4.10 Recreation

The mineral exploration and activities conducted under the Plan of Operations, in combination with similar actions, could prevent continued access by recreational users to some of the public lands within the CESA. Fugitive dust from vehicle traffic on unpaved roads, as well as noise and traffic from cumulative activities, could cause some recreational users to avoid those active portions of the area during the cumulative project construction and operational activities. The contribution of the project to these indirect cumulative effects on recreation would be minimal.

4.11 Visual Resources

The CESA is designated as VRM Class IV by the BLM. Construction activities associated with the mineral exploration and other RFFAs in Class IV areas could result in long-term cumulative modification to the line, form, color, and texture of the landscape in the CESA. However, the contribution of the Jersey Valley Facility to cumulative effects on visual resources would be minimal. Cumulative effects can be mitigated through consistent application of the VRM Class IV standards by the BLM and project applicants.'

4.12 Socioeconomic Values

Construction of the Jersey Valley Facility is expected to require 75 to 80 workers over a 12-month period. Operation of the project is expected to require 20 workers. This pattern of a large temporary workforce followed by a smaller number of full-time employees is typical for large industrial projects like the Jersey Valley Facility. While the short-term cumulative effect of these projects may be to place temporary burdens on local housing, infrastructure, and public services, they would not result in long-term adverse cumulative effects resulting from induced population growth.

4.13 Land Use Authorizations

Several ROWs have been granted by the BLM on public lands within the Jersey Valley Facility area, generally consisting of ROWs for power lines, telephone lines, access roads, and pipelines. In addition, a public water reserve and several authorizations for fences and a pipeline are located in the Jersey Valley area. Such grants of ROWs are one of the basic roles of the BLM, as manager of large amounts of federal land, in addition to state, county and local agencies, which issue permits for buildings and land use changes, and undertake infrastructure projects for roads and highways, utilities, public buildings, water supply, and wastewater and stormwater facilities. All of these authorizations are typically granted in compliance with adopted laws, regulations and long-range plans, and with some measure of coordination among the responsible agencies. The presence of these agencies, their regulations and plans, and coordinating efforts can serve to minimize any long-term adverse cumulative effects associated with new development.

APPENDIX C

Summary of McGinness Hills Facility EA

1 INTRODUCTION

1.1 SUMMARY AND LOCATION OF PROPOSED ACTION

Ormat is proposing to develop the McGinness Hills Geothermal Development Project (McGinness Hills Facility). The Project includes two power generating facilities; geothermal production and injection well pads and wells; access roads; geothermal production and injection pipelines; a microwave communication tower at each power plant; a domestic water well located at each of the power plants; an electrical transmission line and co-located fiber optic line; and ancillary support facilities. Components of the proposed project directly related to the geothermal resource would be located within the McGinness Hills Geothermal Unit, comprised of federal geothermal leases and the Lake Ranch lease on private land. The Unit Area encompasses approximately 7,680 acres of public lands managed by the BLM and private lands. A 9-mile, 230 kV overhead transmission line and fiber optic line would originate at the new McGinness Hills substations adjacent to the power plants and terminate at the NV Energy Frontier substation.

1.2 PURPOSE AND NEED

In accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) and its implementing regulations, public lands are to be managed for multiple use that includes renewable and non-renewable resources. The Secretary of the Interior is authorized to grant rights-of-way on public lands for systems of generation, transmission, and distribution of electric energy. Consistent with BLM's multiple use mandate, the purpose and need for the McGinness Hills Facility is to respond to Ormat's Right-of-Way (ROW) application. BLM's need for the project is to respond to the Operations Plan, Utilization Plan and ROW application submitted by the proponent to construct and operate the McGinness Hills Facility. If approved, the project would assist the BLM in achieving the objectives in the Energy Policy Act of 2005, and further the purpose of Secretarial Order 3285A1, which identified the development of environmentally responsible renewable energy as a priority for the Department of the Interior.

2.0 PROPOSED ACTION AND ALTERNATIVES

Phases I and II of the McGinness Hills Facility would include two 33-megawatt binary air- and water-cooled geothermal generating facilities to be located within the McGinness Hills Geothermal Unit. The McGinness Hills Geothermal Unit encompasses approximately 7,680 acres of private lands and public lands administered by the BLM. The facility would also include geothermal production and injection well pads and wells; access roads; geothermal production and injection pipelines; a microwave communication tower; and ancillary support facilities.

A microwave communication tower and antenna would be constructed on the power plant site to deliver signals from control centers and other remote locations, and to report operating status. It would also provide voice communication from dispatchers to power plant operators and maintenance personnel. The tower would be approximately 40 feet high with a microwave antenna aimed toward an existing communication link at Austin Peak.

A nine-mile 230kV overhead transmission line and fiber optic line would be constructed from the new McGinness Hills substations adjacent to the power plants to the existing NV Energy Frontier substation. Approximately three miles of the transmission and fiber optic lines would be located on public lands administered by the BLM, while the remaining six miles would be located on public lands managed by the U. S. Forest Service (USFS).

Production wells flow geothermal fluid to the surface. Injection wells are used to inject geothermal fluid from the power plant into the geothermal reservoir. Injection ensures the longevity and renewability of the geothermal reservoir. Combined, the two power plants would require 11 production wells (seven on public lands managed by the BLM and 4 on private lands) and 11 injection wells (ten on public lands managed by the BLM and 1 on private land). These sites are comprised of previously approved sites as identified in the McGinness Hills Exploration EA, relocated sites, private land sites and newly proposed sites. Two of the production wells would be drilled from the same well pad.

Approximately 3.65 miles of production pipeline (3.28 miles on public lands managed by the BLM and 0.37 miles on private land) and 5.33 miles of injection pipeline (5.26 miles on public land managed by the BLM and 0.07 miles on private land) would be constructed. A 60-foot wide construction corridor would be needed along the length of the pipeline. Long-term disturbance associated with pipeline operation assumes a 20-foot width along the length of the pipeline, as some of the short-term construction disturbance would be reclaimed flowing completion of construction.

The McGinness Hills Facility would permanently disturb approximately 217 acres of land, 183 acres of which is land managed by the BLM. Table 1 summarizes temporary and permanent land disturbance associated with the McGinness Hills Facility.

A more detailed description of the McGinness Hills Facility and alternatives, including the No Action Alternative, can be found in the *McGinness Hills Geothermal Development Project EA*, which is incorporated by reference in this document. (BLM, 2011a).

Table 1 Summary of Surface Disturbance: McGinness Hills Facility

Description	On BLM Land	On USFS Land	On Private Land	On All Land (Total)
Acres of Temporary Disturbance from Geothermal Components	50.7		3.1	53.8
Acres of Permanent Disturbance from Transmission Line/Fiber Optic Line	4.6	10.3		14.9
Subtotal	**55.3**	**10.3**	**3.1**	**68.7**
Acres of Temporary Disturbance from Geothermal Components	127.1		21.1	148.2
Acres of Permanent Disturbance from Transmission Line/Fiber Optic Line	0.1	0.2		0.3
Subtotal	**127.2**	**0.2**	**21.1**	**148.5**
TOTAL DISTURBANCE	**182.5**	**10.5**	**24.2**	**217.2**

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the affected environment and potential impacts from implementation of the McGinness Hills Facility. The McGinness Hills Facility area is located in the McGinness Hills area of Lander County, Nevada. The project would be located on public lands managed by the BLM, as well as, private lands. Public and private lands would be impacted during the construction and operation of the Proposed Action. A more detailed description of the facility is contained in section 2.4 of this EA. A detailed assessment of the affected environment and potential environmental consequences associated with the McGinness Hills Facility and alternatives are provided in the *McGinness Hills Geothermal Development Project, Lander County, Nevada – Environmental Assessment, Battle Mountain District Office, June 2011*, which is incorporated by reference in this EA.

There are several alternatives for the McGinness Hills Facility, which are described in the McGinness Hills EA (BLM, 2011a). The following sections that summarize potential impacts to the environment from the McGinness Hills Facility address only the proposed McGinness Hills Facility and do not discuss the alternatives. A discussion of the alternatives is provided in the McGinness Hills EA (BLM, 2011a).

Table 2 identifies the elements (supplemental authorities) that were addressed under NEPA. Table 2 also identifies whether the McGinness Hills Facility would affect that element. For those elements that would not be affected by the McGinness Hills Facility, no further discussion in this EA is provided.

Table 2 NEPA Supplemental Authorities Relevant to the McGinness Hills Facility

Element	Present Yes/No	Affected Yes/No	JUSTIFICATION
Air Quality	Yes	Yes	Section 3.4.1
Cultural Resources	Yes	Yes	Section 3.4.2
Native American Religious Concerns	Yes	Yes	Section 3.4.3
Migratory Birds	Yes	Yes	Section 3.4.4
Threatened, and/or Endangered, Species	No	No	Section 3.4.4
Water Quality and Quantity	Yes	Yes	Section 3.4.9
Wetlands and Riparian Zones	Yes	No	Section 3.4.10
Waste (Hazardous and Solid) & Health and Safety	Yes	Yes	Section 3.4.11
Paleontology	Yes	Yes	Section 3.4.12
Rangeland	Yes	Yes	Section 3.4.13
Environmental Justice	No	No	No minority or low-income populations would be disproportionately affected by the project.
Fish Habitat	No	No	There is no fish habitat in the proposed project area.
Floodplains	No	No	There are no FEMA-designated 100-year floodplains in the proposed project area.
Prime or Unique Farmlands	No	No	There are no prime or unique farmlands in or near the proposed project area.
Wild and Scenic Rivers	No	No	There are no wild and scenic rivers in the proposed project area.
Wilderness	No	No	There are no wilderness areas or wilderness study areas within the proposed project area.

Other resources of the human environment that have been considered for this EA are listed in Table 3.

Table 3 Other Resources Relevant to the McGinness Hills Facility

Other Resources	Present Yes/No	Affected Yes/No	Comments
Wildlife Resources	Yes	Yes	Section 3.4.4
Special Status Species	Yes	Yes	Section 3.4.4
Invasive, Non-native Species and Noxious Weeds	Yes	Yes	Section 3.4.5

Other Resources	Present Yes/No	Affected Yes/No	Comments
Noise	Yes	Yes	Section 3.4.6
Soils	Yes	Yes	Section 3.4.7
Vegetation	Yes	Yes	Section 3.4.8
Recreation	Yes	Yes	Section 3.4.14
Visual Resources	Yes	Yes	Section 3.4.15
Socioeconomic Values	Yes	Yes	Section 3.4.16
Land Use Authorizations	Yes	Yes	Section 3.4.17
Geology and Minerals	Yes	No	Geology and Minerals would not be adversely affected by implementation of the Proposed Action. Geothermal resources are a leasable mineral and given that the resource is not consumed during plant operations, geothermal resources should not be affected.
Wild Horse and Burro	No	No	There are no Herd Management Areas in the Project Area

Based on the information in Tables 2 and 3, the following resources were analyzed in the McGinness Hills EA (BLM, 2011a) and are briefly summarized in the following sections.

- Air Quality
- Cultural Resources
- Native American Religious Concerns
- Wildlife Resources/Special Status Species/Migratory Birds
- Invasive Non-Native Species and Noxious Weeds
- Noise
- Soils
- Vegetation
- Water Quality and Quantity
- Wetlands and Riparian Zones
- Solid or Hazardous Wastes
- Rangeland
- Recreation
- Visual Resources
- Socioeconomic Values
- Land Use Authorizations

3.1 Air Quality

Affected Environment

Air quality in Lander County has been designated as "attainment/unclassified", which means it either meets, or is assumed to meet, the applicable federal ambient air quality standards for all standard ("criteria") air pollutants including ozone, carbon monoxide, nitrogen dioxide, sulphur dioxide, inhalable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), lead particles and hydrogen sulphide. Neither the McGinness Hills Facility area nor the transmission line and water pipeline corridors are located in or adjacent to any mandatory Class I (most restrictive) federal air quality areas, USFWS Class I air quality units, or American Indian Class I air quality lands. A more detailed description of existing air quality conditions is included in section 3.2 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

During construction activities, fugitive dusts would be an air pollutant of concern. Combustion emissions of criteria air pollutants, air pollutant precursors, and air toxics would be released during well drilling and construction activities from diesel engines used. Small quantities of naturally occurring gases, such as carbon dioxide, hydrogen sulfide, nitrogen, and methane, would be emitted during geothermal well testing.

With a binary power plant, some of the binary working fluid (pentane) would be released to the atmosphere from gaskets, rotating seals, and flanges during operations. Small amounts of pentane would also be discharged from a stack during normal operations. Additionally, during servicing, small amounts of residual liquid pentane would be discharged when the power plant unit is opened. All pentane emissions are estimated to average about 12 tons per year. These emissions would be regulated under a permit issued by NDEP. A more detailed description of potential air quality impacts is included in section 3.2 of the McGinness Hills EA (BLM, 2011a).

3.2 Cultural Resources

Affected Environment

Class III cultural resource inventories of the project area were completed in 2009 and 2010. Based on the survey findings, the McGinness Hills Archaeological District (MHAD) has been proposed on selected public and private lands. The MHAD is eligible for listing in the National Register of Historic Places (NRHP) (BLM, 2011a). Numerous sites were recorded, of which 36 are recommended as contributing elements. The MHAD is recommended to be significant and eligible to the NRHP under Criteria A (associated with events that have made a significant contribution to the broad patterns of history), Criteria C (embody the distinct characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction), and Criteria D (have yielded, or may be likely to yield, information important in history or prehistory).

Forty-four sites were recorded on, or partially on, USFS lands. Of these, 36 are entirely on USFS lands; 4 are on USFS and BLM lands; 3 are on USFS and private lands; and 1 is on USFS, BLM, and private lands. Sites on, or partially on, USFS lands are not considered to be part of the MHAD by the Forest Service. Of the sites that are on USFS lands, 16 are Eligible to the NRHP and one is unevaluated. One site is partially on USFS and BLM land and is recommended as eligible to the NRHP and as a contributing element to the MHAD. A more detailed description of existing cultural resources is included in section 3.3 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Twenty eligible sites in the MHAD may be impacted by McGinness Hills Facility, and four eligible sites (on private land) have already been impacted. In addition, nine eligible and/or unevaluated sites on, or partially on, USFS lands would be or may be impacted by the proposed project. Contributing sites and sites determined eligible for listing in the NRHP are formally designated as "historic properties" and any adverse effects to these resources as a result of a federal undertaking must be mitigated. Mitigation is proposed in the form of a "Master Treatment Plan". Treatment/mitigation recommendations for all prehistoric and historic resource categories have been developed and can be found in section 3.3 of the McGinness Hills EA (BLM, 2011a).

3.3 Native American Religious Concerns

Affected Environment

Located within the traditional territory of the Paiute and Western Shoshone Tribes, the BLM Battle Mountain District Office administrative boundary contains spiritual/traditional/cultural resources, sites, and social practices that aid in maintaining and strengthening social, cultural, and spiritual integrity. Recognized tribes with known interests within the BLM Battle Mountain District Office administrative boundary are the Te-Moak Tribe of Western Shoshone (Elko, South Fork, Wells, and Battle Mountain Bands), Duck Valley Shoshone-Paiutes Tribe of Duck Valley Tribes of Idaho and Nevada, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Yomba Shoshone, the Timbisha Shoshone Tribe, and various other Tribal groups, community members, and individuals.

Based on cultural resource inventories, the area of the McGinness Hills Facility were proposed as the MHAD. There are a total of 172 loci and 114 isolated artefacts/features identified in the MHAD. As a result, the district has been determined eligible for listing in the NRHP. These sites of importance may include antelope traps; certain mountain tops used for prayer; medicinal and edible plant gathering locations; prehistoric and historic village sites and gravesites; hot and cold springs; material used for basketry; locations of stone tools, chert and obsidian quarries; hunting sites; sweat lodge locations; locations of consistent pine nut harvesting and ceremonies, traditional gathering, and camping; boulders used for offerings and medicine gathering; and tribally identified Traditional Cultural Properties (TCP's).

In accordance with the National Historic Preservation Act and other federal statutes and regulations, federal agencies must provide affected tribes an opportunity to comment and consult on the proposed project with the goal of limiting, reducing, or possibly eliminating any negative impacts to Native American traditional/cultural/spiritual sites, activities, and resources. In early 2010, BLM and USFS initiated consultation activities with the Battle Mountain Band Council, Duckwater Shoshone Tribe, Yomba Shoshone Tribe and Te-Moak Tribal Council, Elko Band Council, Western Shoshone Defense Project, South Fork Band Council, Ely Shoshone Tribe, Timbisha Shoshone Tribe and the Western Shoshone Descendants of Big Smoky. Informational field visit(s) with tribal representative(s) is pending. Consultation would be ongoing until completion of the project. Further discussion of resources of Native American Religious Concern can be found in section 3.4 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Vehicles, equipment, and personnel used for planning, exploration, construction and maintenance purposes can have negative impacts to areas utilized by native peoples and associated artifacts. Long and short-term noise and visual impacts can have a detrimental impact to existing cultural/traditional/spiritual activities that may occur in certain areas. Sacred sites such as prayer, sweat lodge, medicinal/strength gathering, and edible/medicinal plant gathering locations must remain quiet and undisturbed, and a sense of reverence maintained. Archaeological sites within or in close proximity to certain project boundaries have been known to experience various levels of degradation, thus eliminating not only the physical evidence of native occupation, but also archaeological data, which can produce a better understanding of past and present cultures. Roads leading to project activities, can experience further use by members of the public to access formerly inaccessible locations. If members of the general public increasingly utilize project roads, the cultural/traditional/spiritual integrity of any adjacent Native use site may be compromised. Also, the act of drilling wells is often viewed by traditional practitioners and believers as being harmful to "mother earth" due to impacts to underground and surface waters, which are considered the "life blood of the Earth and all who dwell upon it."

Though the possibility of disturbing Native American gravesites within the McGinness Hills Facility area is extremely low, procedures for inadvertent discovery would be implemented. Under federal statute and regulations, the discovering individual must notify the land manager in writing of such a discovery. If the discovery occurs in connection with an authorized use, the activity must cease and the materials are to be protected until the land manager can respond to the situation. If any traditional cultural properties or artifacts are identified before or during development activities, a protective "buffer zone" may be acceptable, where physical avoidance is an issue, and if doing so satisfies the needs of the BLM, the proponent and affected Tribe. The size of any "buffer zone" would be determined by all participating entities. All NRHP-eligible and unevaluated cultural sites identified during the cultural resources inventory would be avoided. Additional information on potential impacts to spiritual/traditional/cultural resources, sites, and social practices is provided in section 3.4 of the McGinness Hills EA (BLM, 2010).

3.4 Wildlife, Special Status Species, and Migratory Birds

Affected Environment

A biological survey of the project area was conducted in July of 2010, and modified sections of the area were surveyed in November of 2010. The variety of vegetation communities within the survey area provided habitat for a diversity of wildlife species observed during the field survey, or for which BLM and/or the Nevada Department of Wildlife (NDOW) had records of observations. A list of wildlife species observed is presented in section 3.5 of the McGinness Hills EA (BLM, 2011a).

Threatened and Endangered Species

A letter requesting information on threatened and endangered species that may occur within the McGinness Hills Facility area was received by USFWS in July of 2010. In response, the USFWS indicated that no listed or proposed species exist in the proposed project area. However, the greater sage-grouse, a candidate species, may occur in the area. The USFWS also indicated that potential habitat for pygmy rabbit, a BLM and USFS Region 4 sensitive species, may occur in the McGinness Hills Facility area. The agency recommended that surveys for golden eagles be conducted if the species occurs within ten miles of the project area.

NNHP also had no record of any endangered, threatened, candidate, and/or At-Risk plant or animal species within or near the project area. However, NNHP indicated that habitat may be present in the project area for pygmy rabbits and Townsend's big-eared bat, both BLM and USFS Region 4 sensitive species. NNHP also indicated that habitat for the western small-footed myotis, a Nevada BLM sensitive species, may be present. Detailed species descriptions can be found in Section 3.5 of the McGinness Hills EA (BLM, 2011a).

Special Status Species – Plants

Sixteen sensitive plant species are known to occur in the Austin-Tonopah Ranger District and Mount Lewis Field Office. Of these, 12 were eliminated from further consideration based on known habitat criteria and the lack of those criteria in the survey area. None of the four species were observed during the surveys. Detailed species descriptions can be found in Section 3.5 of the McGinness Hills EA (BLM, 2011a).

Special Status Species – Wildlife

Nineteen sensitive wildlife species are known to occur in the Austin-Tonopah Ranger District and Mount Lewis Field Office. Of these, six were eliminated from further consideration based on known habitat criteria and the lack of those criteria in the survey area. The 14 wildlife species known to occur in the survey area include Bald eagle, Golden eagle, Ferruginous hawk, Prairie falcon, Long-eared owl, Greater sage-grouse, Hairy woodpecker, Small-footed bat, Spotted bat, Townsend's big-eared bat, Pygmy rabbit, Mule Deer, Bighorn sheep, and Northern

goshawk. Detailed descriptions of these species can be found in section 3.5 of the McGinness Hills EA (BLM, 2011a).

Migratory Birds

Migratory birds are found in the McGinness Hills Facility area as either seasonal residents or as migrants. A detailed list and discussion of migratory birds species can be found in section 3.5 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Surface disturbance associated with construction activities would result in the loss of wildlife habitat. A slight reduction in wildlife carrying capacity would be expected to occur for some species, but most wildlife would be expected to adjust and relocate to similar habitat that is abundant in the project vicinity. The transmission line would increase raptor perch sites and increase mortalities from collisions and electrocutions. ORMAT has agreed to adopt transmission line raptor protection practices, which would reduce mortalities. Project-generated noise could also keep some animals away from areas directly affected by surface disturbance during construction and operation. Wildlife would be able to re-occupy the disturbed areas upon completion of the project and site reclamation. There should be no residual impacts to wildlife resources.

There would be no impacts to threatened and endangered species, as none are known to exist within the surveyed portions of the project area. There would also be no impacts to special status plant species because no populations of any identified are known to occur within the project area. Project construction (regardless of the season constructed) would result in the temporary and short-term loss of migratory bird habitat until reclaimed. Migratory birds would adjust and relocate to abundant similar habitat in the vicinity and beyond. Detailed discussions of potential impacts to wildlife, special status species and migratory birds can be found in section 3.5 of the McGinness Hills EA (BLM, 2011a).

3.5 Noxious Weeds and Invasive, Non-Native Species

Affected Environment

Noxious weeds are defined as "any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate." Invasive non-native plant species are defined as alien species whose introduction is likely to cause economic or environmental harm or harm to human health. Invasive species often displace native species and become dominant, in turn affecting native flora, wildlife, watersheds, fire regimes, and recreation. Both types of plants can spread when seeds or vegetative plant parts are carried, transported or deposited into and infest weed-free areas by people, equipment, livestock/wildlife, wind or water. As of 2010, the State of Nevada listed 47 species on the Nevada Noxious Weed List.

A noxious weed, invasive and non-native species inventory was conducted during the biological survey of the McGinness Hills area. Two noxious weed species were identified along portions of Grass Valley Road: hoary cress and bull thistle. The hoary cress infestations ranged from a few plants to patches up to 0.1 acre. The bull thistle infestations were ten or fewer plants. Detailed descriptions of these species can be found in section 3.6 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

The McGinness Hills Facility could contribute to the spread of noxious weeds, invasive and non-native species in the area and along the transmission line and pipeline corridors through surface disturbing activities and transport by construction and drilling vehicles. EPMs to minimize the spread of noxious weeds are presented in section 2.1.11 of the McGinness Hills EA (BLM, 2011a).

3.6 Noise

Affected Environment

Noise is most often measured in dB, units that measure the apparent loudness of sound. Because the human ear is more sensitive to some sound frequencies than others, sound measured by a noise meter is typically adjusted so that it approximates sound that would be heard by the human ear. Units of noise measurement recorded by such an adjusted noise meter are termed "A-weighted decibels" (dBA). Because noise levels in the environment fluctuate with time, a time-averaged noise level in dBA (Leq) is often used to characterize the noise environment at a given location. Examples of noise levels include 30-35 dBA (whispered conversations at 6 feet), 40-50 dBA (residential areas during daytime), 60 dBA (normal conversation at 3 feet), and 70 dBA (a vacuum cleaner at ten feet).

The loudness of sound diminishes with distance from the source of the sound. The rate at which sound attenuates with distance is affected by multiple factors, including: topography, ground surface, vegetation, wind direction, air turbulence, humidity and temperature. Baseline noise levels in the McGinness Hills Facility are assumed to be consistent with similar, rural environments, where ambient sound levels can range from below 30 to above 50 dBA. More information on existing noise in project area can be found in section 3.7 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

The primary source at the McGinness Hills Facility would be from the air-cooled condensers and water cooling tower associated with the power plant. To a much lesser extent, pumps associated with the production wells would also produce a measurable amount of noise. Sound data was collected from an existing geothermal facility in Nevada, and that noise data was applied in a model to determine the potential noise impact on receptors near the proposed McGinness Hills geothermal power plants. The data suggest that noise generated from the McGinness Hills

Facility facilities would be minimal at receptor sites (sage-grouse leks) surrounding the project site. More information on potential impacts from noise is contained in section 3.7 of the McGinness Hills EA (BLM, 2011a).

3.7 Soils

Affected Environment

Soil associations within the McGinness Hills Facility area, transmission line, and the water pipeline corridor have been mapped by the NRCS in Lander County. The majority of the soils are clay loams. However, several calcareous soils were also present. These soils range from very low to high available water capacity. The soils are generally shallow to deep, ranging from rock outcrops to 80 inches deep. More information on existing soil conditions in the project area can be found in section 3.8 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

The potential for wind erosion within the project area is relatively low. The water runoff potential for the soil associations in the project is moderate to high. Surface disturbance and vegetation removal during construction of proposed project facilities within the project area could increase the potential for erosion through exposure of denuded surfaces. Additional discussion of potential impacts to soils can be found in section 3.8 of the McGinness Hills EA (BLM, 2011a).

3.8 Vegetation

Affected Environment

Based on field surveys, 21 different vegetation community types are present within one mile of the McGinness Hills Facility. Seventeen of the vegetation community types occur on BLM-managed lands, seven occur on USFS-managed lands, and three occur on both BLM- and USFS-managed lands. There have been no recorded fires within the project area. Detailed information on existing plant communities, including maps, can be found in section 3.9 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Surface disturbance associated with construction and operation of the McGinness Hills Facility, transmission line, and water pipeline would result in the loss of vegetation. Approximately 207 acres of disturbance would be temporary and vegetation would be allowed to recover after construction is completed. Approximately 134 acres of disturbance would permanent and would be lost over the life of the McGinness Hills Facility. However, these areas would be recovered without residual impact during site reclamation. Additional information on potential impacts to vegetation can be found in section 3.9 of the McGinness Hills EA (BLM, 2011a).

3.9 Water Quality and Quantity

Affected Environment

Surface Water Resources

Surface water resources in the McGinness Hills area include ten known cold springs located west of Grass Valley Road and one cold spring in the eastern portion of the project area upstream of Lake Ranch. No thermal (hot) springs have been identified in or near the McGinness Hills Facility. The Nevada Division of Water Resources water rights database shows two vested water rights in the project area. These vested water rights are both associated with livestock watering.

Flows within several named and unnamed creeks in southern Grass Valley were measured by USGS in the spring and fall of 1965. The highest recorded springtime flow was 15 cubic feet/sec (cfs) in Skull Creek. Flows measured in the fall were much less than flows during the spring, as is common in north central Nevada.

Groundwater Resources

The perennial yield (the amount of water that can be drawn indefinitely without depleting the resource) in the Big Smoky Valley basin is estimated to be 65,000 acre-feet per year (af/yr). Total allocated groundwater rights are approximately 53,000 af/yr, with the primary uses being agriculture and mining. In November 2010 ORMAT filed two applications for water right permits in this basin, which have not yet been approved.

The northernmost portion of the facility site, and the proposed water supply wells, are located within the Grass Valley Basin. The perennial yield of this basin is estimated to be 13,000 af/yr (BLM, 2011a). Total allocated groundwater rights in this basin are approximately 12,600 af/yr with the primary uses being agriculture and mining. In November 2010, ORMAT filed three applications for water right permits, which have not yet been approved.

Water Quality

The chemistry of cold-water springs and thermal water were analyzed and compared. Based on substantial differences in water chemistry, it does not appear there is appreciable mixing of the geothermal waters and the cold water springs in the project area. Data on the chemical quality of water from two wells in southern Grass Valley indicates that groundwater quality is dilute with no obvious problems relating to the use of these waters for agriculture. Additional discussion of existing water quantity and quality conditions is contained in section 3.10 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Geothermal wells would be drilled using non-toxic drilling mud to prevent the loss of drilling fluids and minimize the risk of contamination to any aquifers. Because non-toxic drilling mud would be used, contamination of the local ground water aquifers as a result of the temporary discharges into the reserve pits is unlikely.

Over the operational life of the project, accidental discharges of geothermal fluids could contaminate surface or ground waters. Contamination of surface or ground water from spills of petroleum projects (such as diesel fuel or lubricants) is unlikely because the well pads and power plants sites, where most petroleum products would be used and stored, would be bermed to contains and control any spills.

The water well to be drilled at one of the power plant sites would consume approximately 20-30 gpm, or about 2.5-3.0 af/yr, over the life of the project. Even though this is a small annual quantity of water, if the produced aquifer is directly connected to the aquifer feeding the cold springs within the area, it is possible that the flow of the cold springs could be adversely affected. Although water chemistry data suggests there is no interaction between the cold water springs and the thermal fluid in the geothermal reservoir, it is still possible that a connection between the two aquifers could allow the consumption of about 1,250 af/yr of geothermal fluid for power plant cooling water. This could adversely affect either the flow or quality of the cold-water springs. Additional discussion of potential impacts to water quantity and quality is contained in Section 3.10 of the McGinness Hills EA (BLM, 2011a).

3.10 Wetlands and Riparian

Affected Environment

Wetlands and riparian areas comprise less than one percent of the McGinness Hills Unit Area. Riparian areas consisted of meadows and riparian vegetation along some of the creeks and surrounding the springs. Riparian areas were primarily occupied by sedges (*Carex* sp.), rushes (*Juncus* sp.), bluegrass (*Poa pratensis*), foxtail barley (*Hordeum jubatum*), mat muhly (*Muhlenbergia richardsonis*), and meadow foxtail (*Alopercurus pratensis*). Iris (*Iris* sp.) and willow (*Salix* sp.) were also present in some areas.

Based on field investigations conducted in 2010, one primary wetland/riparian area was identified in the southern portion of the project area extending from Dry Lake to the Canyon Cold Spring. The primary hydrologic source for this riparian area is runoff from upstream areas and discharge from Canyon Cold Spring and seeps observed along the hillside. During field investigations, flowing water was observed within the canyon. The seeps in the area have been disturbed by ranchers to provide water for livestock and irrigate the valley. Vegetation in the riparian area is moderately disturbed due to cattle grazing. Additional information on existing wetlands and riparian areas is contained in section 3.11 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Because there is no surface disturbance proposed within any identified wetlands and riparian areas, no impacts are anticipated. As there is riparian vegetation associated with the cold-water springs, impacts could occur if the cold-water springs in the area are affected. However, the water chemistry data suggests that there is no interaction between the cold-water springs and the

thermal fluid in the geothermal reservoir. Therefore, it is unlikely that the McGinness Hills Facility would impact the springs. Additional information on potential impacts to wetlands and riparian areas is contained in section 3.11 of the McGinness Hills EA (BLM, 2011a).

3.11 Waste (Hazardous and Solid) & Health and Safety

Affected Environment

There are no hazardous material storage facilities in the Jersey Valley Facility area or transmission line corridor, nor are hazardous materials known to be routinely used. The transport and handling of hazardous materials in Nevada are subject to numerous Federal and state laws and regulations. Additional discussion of existing conditions related to solid and hazardous materials is provided in section 3.12 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

During drilling activities, diesel fuel, lubricants, hydraulic fluids and drilling chemicals (drilling mud, caustic soda, barite, etc.), would be transported to, stored on and used by the project at the proposed drill sites. Hazardous materials and petroleum products stored on site during normal power plant operations include diesel fuel for the fire pump and standby generator, lubricating oils, and small quantities of paint, antifreeze, cleaning solvents, battery acid, transformer insulating fluid, and laboratory reagent chemicals. Additionally, substantial quantities of the binary working fluid (pentane) would be stored and used (though not consumed or intentionally released). Small quantities of solid and hazardous wastes would be generated by the project. The disposal of these wastes would be a residual impact of the project. Additionally, small quantities of typical office and industrial trash would be generated during power plant operations. The wastes would be transported to an off-site disposal facility authorized to accept the waste based on its type.

The project includes hazardous material spill and disposal contingency plan, which would describe the methods for cleanup and abatement of any petroleum hydrocarbon (including petroleum contaminated soils) or other hazardous material spill. Additional discussion of potential impacts related to solid and hazardous materials is provided in section 3.12 of the McGinness Hills EA (BLM, 2011a).

3.12 Paleontology

Affected Environment

The majority of the rock units present in the Unit area were not expected to produce fossils. The silica sinter deposits near the center of the Unit area and the Valmy Formation were determined to have a low to moderate potential to yield fossils, while the “older” alluvium was determined to have a moderate to high potential for producing fossils.

Environmental Consequences

Project activities are proposed very near one or more of the three rock units within the proposed Project area determined to have the potential to produce significant fossils. Though no proposed Project components are directly within any of those rock units, portions of three injection pipelines abut the silica sinter deposits. Construction activities on these rock units that involve new surface disturbance could result in the disturbance or destruction of potentially important fossils. Surface disturbing activities on the rock units determined to have the potential to produce significant fossils will require pre-disturbance surveys to determine the appropriate course of action. This may include monitoring during surface disturbance activities, avoidance of identified significant fossil localities, or no further action.

3.13 Rangeland

Affected Environment

The McGinness Hills Facility would be located within the Grass Valley (282,854 acres) and Simpson Park (97,167 acres) Allotments. Combined, the allotments represent 23,487 animal unit months (AUMs). The transmission line would cross through both the Lake Ranch and Rye Patch Pastures in the Simpson Park Allotment. The buried water pipeline (and associated power cable) would be built within the Antelope and Lake Ranch pastures of the Grass Valley and Simpson Park Allotments, respectively. Both allotments have range improvements within them, consisting primarily of fences and corrals. Additional discussion of existing range resources is provided in section 3.13 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Permanent surface disturbance associated with the McGinness Hills Facility would be 134.7 acres. This disturbance would reduce the 23,487 AUMs within the combined allotments by two AUMs, or less than one percent. Additional discussion of potential impacts to range resources is provided in section 3.13 of the McGinness Hills EA (BLM, 2011a).

3.14 Recreation

Affected Environment

Recreation use within the McGinness Hills area is low and consists primarily of dispersed recreation activities such as hunting, OHV use, wildlife viewing, camping and rockhounding. There are no organized OHV racecourses within the project area. The Pony Express Historic Trail is more than five miles away. Additional discussion of existing recreation resources is provided in section 3.14 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Development of the McGinness Hills Facility would not prevent continued access by recreational users to the public lands within the project area. Project operations should also not impact the ability of hunters to access previous hunting grounds, or impact the abundance of game animals. Air quality impacts to recreational users could include fugitive dust from vehicle traffic on

unpaved roads, and exhaust from construction vehicles. However, these impacts are expected to be minimal. Project-generated noise and traffic could cause some recreational users within the project area to stay away during project construction and drilling activities. These indirect effects would be temporary and short-term. The project should have no residual adverse impacts to recreation. Additional discussion of potential impacts to recreation resources is provided in section 3.14 of the McGinness Hills EA (BLM, 2011a).

3.15 Visual Resources

Affected Environment

The BLM VRM process is used to evaluate the potential impacts to visual resources resulting from development activities. VRM class designations are based on the scenic value of the landscape, viewer sensitivity to scenery, and the distance of the viewer to the subject landscape. The management classes also identify permissible levels of landscape alteration while protecting the overall visual quality of the region. They are divided into four levels (Classes I, II, III, and IV), with Class I the most restrictive and Class IV the least restrictive.

The entire McGinness Hills area is designated VRM Class IV. Class IV provides for management activities that require major modification of the existing landscape. The level of change to the landscape can be high, and management activities may dominate the view and be the major focus of viewer attention. However, activities are to be managed to minimize impacts through careful location, minimal disturbance, and repeating basic landscape elements. Additional discussion of visual resources is provided in section 3.15 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Drilling operations at the McGinness Hills Facility would be visible in the area during construction and intermittently over the life of the project. Drilling rigs would be up to 175 feet in height. Well drilling operations would typically take about 45 days to complete each well. These operations would be 24 hours per day, seven days per week. During drilling operations, the rig would be visible at distances of more than one mile, and lights used when drilling at night would increase drill rig visibility. Impacts to visual resources from drilling operations would primarily affect the elements of line and color. Additional discussion of potential impacts visual resources is provided in Section 3.15 of the McGinness Hills EA (BLM, 2011a).

3.16 Socioeconomic Values

Affected Environment

In 2009, Lander County had a total population of 5,047, and the Battle Mountain Census Designated Place had an estimated population of 2,711. Austin's 2007 population was estimated 417. Lander County had 2,287 total housing units in 2009, of which 1,834 were occupied. The Battle Mountain CDP had 1,163 housing units of which 964 were occupied. In 2007 the town of Austin had an estimated 357 housing units, of which 220 were occupied.

The 2009 labor force in Lander County was estimated at 2,331. Lander County's leading employment sectors included the agriculture, forestry, fishing and hunting, and mining industry (29.3%); construction, extraction, maintenance and repair occupations (26.9%); and management, professional and related industries (21.4 percent). The labor force for the Battle Mountain CDP was estimated at 1,205 and leading employment sectors included construction, extraction, maintenance and repair (30.7%); agriculture, forestry, fishing and hunting, and mining industry (30.4%); and service occupations (27.5%). Additional discussion of socioeconomic conditions is provided in section 3.16 of the McGinness Hills EA (BLM, 2011a).

Environmental Consequences

Construction of the project would require 12 to 18 months to complete once all permits are obtained and equipment orders scheduled. Construction of the well field, pipelines, and power plant(s) within the McGinness Hills Facility area is projected to require up to 100 workers, with an average of 20 workers after grading and excavation activities are completed. Construction of the transmission line and water pipeline would require approximately eight to ten workers.

Once operational, the project would employ five to eight workers if it was remotely operated; and 8 to 15 workers if not remotely operated. A small amount of spending activity associated with the construction of the project is expected and would have a small but positive effect on local businesses in Lander County. Given the small number of workers needed, the project would not induce population growth in an area. Additional discussion of potential impacts to socioeconomic conditions is provided in section 3.16 of the McGinness Hills EA (BLM, 2011a).

3.17 Land Use Authorizations

Affected Environment

Several ROWs have been granted by the BLM on public lands within the McGinness Hills area, transmission line corridor, and water pipeline corridor. They generally consist of ROWs for power lines, aggregate pits and geothermal leases. Section 3.17 of the McGinness Hills EA provides detailed information on the location, type and holder of each ROW (BLM, 2011a).

Environmental Consequences

Because project activities within the McGinness Hills area are located away from the authorized ROWs, there would be no impacts to lands and realty within the geothermal operations area. Transmission line poles would not be located within any existing ROWs. The transmission line wires would pass over several land use authorizations, but would not interfere with any existing ROWs. Additional discussion of potential impacts to land use authorizations is provided in Section 3.17 of the McGinness Hills EA (BLM, 2011a).

4.0 CUMULATIVE EFFECTS

This section summarizes the cumulative effects analysis for the McGinness Hills Facility, which is contained in the *McGinness Hills Geothermal Development Project, Lander County, Nevada – Environmental Assessment, Battle Mountain District Office, June 2011*, and which is incorporated by reference in this EA. Based on the analysis of potential environmental consequences the McGinness Hills EA concluded that the following resources were appropriate for the assessment of cumulative effects:

- Air Quality
- Cultural Resources
- Native American Religious Concerns
- Wildlife (including TES Species, and Migratory Birds)
- Invasive Non-Native Species and Noxious Weeds
- Soils
- Vegetation
- Water Quality and Quantity
- Solid or Hazardous Wastes
- Rangeland
- Recreation
- Visual Resources
- Socioeconomic Values

The past, present, and RFFAs that would contribute to cumulative impacts within the CESA include livestock grazing, recreational activities, transportation and access, wildfires, wild horse and burro use (including wild horse gathers), wildlife use, mineral exploration, and a wind farm. A description of these activities is provided below.

Livestock Grazing

Portions of four BLM-managed grazing allotments are within the CESA: Grass Valley, Simpson Park, Underwood and Austin. Portions of three USFS-managed grazing allotments are within the CESA: Lake Flat, Bade Flat, and Cahill. In order to support the management of these allotments, a variety of range improvement projects have been implemented through the years, including fences, cattle guards, and wells.

Recreational activities

Dispersed recreation occurs within the CESA and includes OHV use, wildlife viewing, and hunting. Portions of the Hickison Petroglyph Recreation Area are also within the CESA.

Transportation and Access

Past and present actions within the CESA are supported by a transportation system, which includes gravel county roads, forest service roads, and dirt roads or "two-tracks" on public lands. Few are regularly maintained.

Wildfires

There has been one wildfire within the CESA within the past five years. The Iowa Complex (Silver Creek) fire burned approximately 1,745 acres in 2006.

Wild Horse and Burro Use

Portions of two BLM-managed HMAs are within the CESA: Callahan HMA and the Bald Mountain HMA.

Wildlife Use

Populations of numerous wildlife species exist within the CESA and migrant wildlife species use habitat within the CESA as well.

Mineral Exploration

Hundreds of active mining claims exist within the CESA.

Wind Farm

Based on the results of the wind anemometers, a wind energy facility could be constructed within the reasonably foreseeable future. Typical components of a wind farm would be the horizontal wind turbines used for power generation, access roads, transmission line and various ancillary support facilities.

The McGinness Hills Facility CESA is defined differently for each resource addressed in the cumulative effects analysis. The CESA for biological resources is the Toiyabe Planning Management Unit. The CESA for the remaining resources is an area of approximately 352,680 acres, which was defined based on cultural, hydrologic, and topographic features. The CESA boundaries are shown in Figure 19 of the McGinness Hills EA.

4.1 Air Quality

Past and present actions have generated fugitive dust, principally from surface disturbing activities and travel on unpaved roads, although fugitive dust emissions cease when the activity (i.e. driving on unpaved roads) ceases. RFFAs are expected to add to these fugitive dust emissions, although the increases could vary depending on a variety of factors. Fugitive dust would be generated by the McGinness Hills Facility during construction but mitigated by implementation of EPMs specified by ORMAT, and the best practical dust control measures specified in the NDEP Surface Area Disturbance Permit. As a result, the potential for cumulative effects from fugitive dust and other emissions is minimal.

4.2 Cultural Resources

The McGinness Hills Facility would be located in an area of high archaeological site density and could adversely affect historic properties, given the close proximity of the various facilities at the site. Impacts to the integrity of any identified National Register listed/eligible sites could occur from mineral exploration and wind farm development activities. Grazing damage is found at virtually all sites and damage by roads fences and agriculture is common. Most of the recorded cultural resources in the CESA exhibit impacts resulting from modern use of the land. Construction activities could increase the likelihood of vandalism of cultural sites.

Impacts to cultural resources could be prevented by site avoidance and by prosecuting offenses under the Archaeological Resources Protection Act. In some cases archaeological monitors (archaeologists permitted by Nevada BLM) may be required by the BLM to ensure that sites are avoided by project activities. If all sites that are determined eligible for inclusion on the NRHP are avoided, and sites whose NRHP status is unevaluated are also avoided, the McGinness Hills Facility would have little or no effect on historic properties, and the cumulative effect would be negligible.

4.3 Native American Religious Concerns

Over the last 15 to 20 years, the BLM and the tribes have witnessed an increase in the use of lands administered by BLM by various groups, organizations, and individuals. New ways to utilize public lands are also on the rise. Livestock grazing, recreation, hunting/fishing, leasing, exploration and development for oil, gas and mining, along with more recent uses such as OHV use, interpretive trails, and mountain biking are among many increasing activities within the BLM Mount Lewis Field Office administrative boundary. In addition to increasing development of public lands, fluid mineral leasing and exploration would continue to contribute to the general decline in sites and associated activities of a cultural, traditional, and spiritual nature.

Though the possibility of disturbing Native American gravesites in the McGinness Hills Facility area is extremely low, procedures for inadvertent discovery would be implemented. Under federal statute and regulations, the discovering individual must notify the land manager in writing of such a discovery. If the discovery occurs in connection with an authorized use, the activity must cease and the materials are to be protected until the land manager can respond to the situation. If any traditional cultural properties or artifacts are identified before or during development activities, a protective "buffer zone" may be acceptable, where physical avoidance is an issue, and if doing so satisfies the needs of the BLM, the proponent and affected Tribe. The size of any "buffer zone" would be determined by all participating entities. All NRHP-eligible and unevaluated cultural sites identified during the cultural resources inventory would be avoided.

4.4 Wildlife (including TES Species and Migratory Birds)

Additional wildlife habitat could be disturbed by mineral exploration and wind farm activities and through the creation of roads and other surface disturbing activities associated with the RFFAs. Wildlife habitat directly disturbed by these activities would be "lost" until reclaimed. General human activity and generated noise could also keep some animals away from habitat not directly affected by surface disturbance. The combined amount of direct and indirect surface disturbance expected from the projects constitutes a small portion of the CESA. There is comparable wildlife habitat in the vicinity and region, and wildlife should be able to move away from small areas of direct disturbance and into adjacent suitable habitat. Reclamation of disturbed areas, as proposed by the project, could reestablish habitat for wildlife.

Threatened and Endangered Species

The McGinness Hills Facility would have no impacts on threatened and endangered species. Therefore, the facility would not contribute to cumulative effects to those species in the CESA.

Special Status Species – Plants

Activities associated with RFFAs would be prohibited in areas where there would be a negative impact on special status species. Implementation of the EPMs proposed for the McGinness Hills Facility for other similar actions could reduce the potential for adverse cumulative effects to special status plant species in the CESA.

Special Status Species – Wildlife

Cumulative effects to special status species would be a direct result of habitat loss, fragmentation and degradation. Activities associated with RFFAs would be prohibited in areas where there would be a negative impact on special status species. Implementation of the EPMs proposed for the McGinness Hills Facility for other similar actions could reduce the potential for adverse cumulative effects to wildlife in the CESA.

Migratory Birds

The amount of surface disturbance created by the McGinness Hills Facility and other RFFAs would constitute a very small portion of the CESA. Mandatory inventories of migratory bird nests and limiting ground disturbing activities during the nesting season, in combination with other measures, would help to reduce the potential adverse cumulative effects to migratory birds in the CESA.

4.5 Invasive Non-Native Species and Noxious Weeds

The McGinness Hills Facility, along with past and present actions and RFFAs has the potential to introduce and contribute to the spread of noxious weeds, invasive and non-native species within the CESA. Ongoing mineral exploration activities would cause the most extensive surface disturbance and present the greatest opportunity for noxious weed, invasive and non-native species introduction and proliferation. The number and size of construction vehicles and

construction activities could lend themselves to transporting noxious weeds, invasive and non-native species to areas where they had not previously existed.

EPMs, such as the inventory and treatment of newly disturbed areas and the washing of construction vehicles and workers' boots, could reduce the potential cumulative spread of these plants in the CESA. Cumulative effects would be further reduced when reclamation (reseeding/revegetation) activities commence.

4.6 Soil Resources

Additional impacts to soils could be expected to occur with future mineral exploration and other activities within the CESA. Additional roads could be constructed and mineral exploration holes drilled. Each of these activities would disturb the soils in the affected areas, which would be "lost" until reclaimed following completion of the Project. Mitigation measure(s) requiring the salvaging of topsoil could help reduce potential cumulative effects if implemented for the McGinness Hills Facility and other similar actions.

4.7 Vegetation

Current and future activities would disturb and/or remove vegetation in the CESA. Mitigation measure(s) requiring timely reclamation and reseeding of disturbed areas, as proposed by the project, would reduce impacts to vegetation. With mitigation measures and the use of best management practices, the contribution of the McGinness Hills Facility to cumulative effects on vegetation would be minimal.

4.8 Water Quality and Quantity

Over the operational life of the McGinness Hills Facility, as with similar projects, accidental discharges of geothermal fluids could contaminate surface or ground waters. Impacts to water quality could result from additional mineral exploration and other activities within the CESA. Risks of those events can reduced with frequent inspections and ultrasonic monitoring and testing of geothermal pipelines. Contamination of surface or ground waters from spills of petroleum products can be further minimized by placing well pads, power plants and other facilities that store petroleum products in bermed containment areas. These and other measures, such as spill and disposal contingency plans, can help to minimize the cumulative effects of these and similar activities throughout the CESA.

4.9 Solid or Hazardous Wastes

The transportation, use, storage and disposal of hazardous materials and wastes are subject to numerous federal, state, and local laws and regulations, which are intended to protect the public and the environment, and which are applicable to all of these past, present and RFFAs.

Hazardous materials would likely be used by both the mineral exploration activities and the activities associated with wind farm construction, including the use of petroleum fuels

(principally diesel fuel), hydraulic fluid, lubricants and drilling chemicals and materials. Additional non-hazardous solid waste and liquids would also be generated by the RFFAs.

Proper handling, storage, and disposal of these hazardous materials, hazardous/regulated wastes and solid wastes by all activities in conformance with federal and state regulations would minimize soil, groundwater, or surface water contamination and the cumulative effects associated with these materials.

4.10 Rangeland

The McGinness Hills Facility, in combination with RFFAs would increase the cumulative loss of vegetation resulting from soil disturbances. In turn, this could lead to incremental losses in the availability of grazing used for livestock. Some of this reduction in forage would be temporary until reclaimed, though some could be longer term. No cumulative activities are expected to prevent livestock access to available sources of water in the area.

The amount of surface disturbance that could impact grazing for livestock constitutes a small percentage of grazing allotments in the CESA. Therefore, the contribution of the McGinness Hills Facility to cumulative effects on grazing management would be minimal. Cumulative effects could be further reduced when reclamation activities commence.

4.11 Recreation

The mineral exploration and wind farm development, in combination with similar actions, could prevent continued access by recreational users to some of the public lands within the CESA. Fugitive dust from vehicle traffic on unpaved roads, as well as noise and traffic from cumulative activities, could cause some recreational users to avoid those active portions of the area during the cumulative project construction and operational activities. The contribution of the project to these indirect cumulative effects on recreation would be minimal.

4.12 Visual Resources

The CESA is designated as VRM Class IV by the BLM. Construction activities associated with the mineral exploration and other RFFAs in Class IV areas could result in long-term cumulative modification to the line, form, color, and texture of the landscape in the CESA. However, the contribution of the McGinness Hills Facility to cumulative effects on visual resources would be minimal. Cumulative effects can be mitigated through consistent application of the VRM Class IV standards by the BLM and project applicants.

4.13 Socioeconomic Values

Construction of the McGinness Hills Facility is expected to require as many as 100 workers over a 12- to 18-month period. Depending on whether the power plant is remotely operated, operation of the plant would require from 5 to 15 workers. This pattern of a large temporary workforce followed by a smaller number of full-time employees is typical for large industrial

projects like the McGinness Hills Facility. While the short-term cumulative effect of these projects may be to place temporary burdens on local housing, infrastructure, and public services, they would not result in long-term adverse cumulative effects resulting from induced population growth.

APPENDIX D

Memorandum of Agreement

MEMORANDUM OF AGREEMENT
BETWEEN BUREAU OF LAND MANAGEMENT,
ELKO DISTRICT OFFICE, TUSCARORA FIELD OFFICE (BLM)
AND THE
NEVADA HISTORIC PRESERVATION OFFICER (SHPO)
AND
ORMAT TECHNOLOGIES, INC. (ORMAT)
REGARDING
TUSCARORA GEOTHERMAL PROJECT

WHEREAS, BLM plans to issue a right-of-way to ORNI 42 LLC. and ORNI 42 LLC. (Ormat) and the U.S. Department of Energy Loan Programs Office (DOE) for a powerline connected to a geothermal power plant near Tuscarora in Elko County, Nevada, and this project is an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, and its implementing regulations, 36 CFR Part 800; and

WHEREAS, BLM has defined the undertaking's area of potential effect (APE) as described in Appendix A; and

WHEREAS, BLM has determined that the undertaking may have an adverse effect on 22 historic properties (26EK1991, 26EK4691/ CRNV-12-8360, 26EK9840/ CRNV-12-11317, 26EK9857/ CRNV-12-11334, 26EK9860/ CRNV-12-11337, 26EK10618/ CRNV-12-14378, 26EK10619/ CRNV-12-14379, 26EK10625/ CRNV-12-14385, 26EK10627/ CRNV-12-14387, 26EK10629/ CRNV-12-14389, 26EK10630/ CRNV-12-14390, 26EK10631/ CRNV-12-14391, 26EK11455/ CRNV-12-15309, 26EK12457/ CRNV-12-16317, 26EK12458/ CRNV-12-16318, 26EK12459/ CRNV-12-16319, 26EK12460/ CRNV-12-16320, 26EK12461/ CRNV-12-16321, 26EK12466/ CRNV-12-16326, 26EK12467/ CRNV-12-16327, 26EK11455/ CRNV-12-15309, 26EK12471/ CRNV-12-16332, 26EK12476/ CRNV-12-16337) that are eligible for the National Register of Historic Places under criterion (d), and has consulted with SHPO pursuant to 36 CFR part 800; and

WHEREAS, in accordance with 36 CFR Part 800, BLM acknowledges and accepts the advice and conditions outlined in Advisory Council on Historic Preservation's (ACHP) "Recommended Approach for Consultation on the Recovery of Significant Information from Archeological Sites," published in the Federal Register on May 18, 1999; and

WHEREAS, DOE wants to comply with its Section 106 responsibilities for the project through concurrence with this Agreement; and

WHEREAS, DOE proposes to issue a loan guarantee to Ormat for the powerline and geothermal power plant that is entirely encompassed by the APE; and

WHEREAS, BLM has consulted with Ormat and DOE regarding the effects of the undertaking on historic properties and has invited them to sign this MOA as a concurring party; and

WHEREAS, the consulting parties agree that recovery of significant information from the archaeological sites listed above may be done in accordance with the published guidance; and

WHEREAS, the consulting parties agree that it is in the public interest to expend funds to implement this project through the recovery of significant information from archaeological sites to mitigate the adverse effects of the project; and

WHEREAS, the consulting parties agree that Indian Tribes that may attach religious or cultural importance to the affected properties have been consulted; and

WHEREAS, to the best of our knowledge and belief, no Native American human remains, associated or unassociated funerary objects or sacred objects, or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001), are expected to be encountered in the archaeological work;

NOW, THEREFORE, BLM, DOE and SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

I. HISTORIC PRESERVATION TREATMENT PLAN

A. The cultural resource management (CRM) firm hired by Ormat will meet BLM's and the Secretary of the Interior's standards and will complete the recordation and data recovery as outlined in Historic Preservation Treatment Plans, accepted by the BLM in consultation with SHPO.

B. BLM will ensure that Ormat provides funds to support a CRM firm and qualified persons in implementation of the treatment plan, including but not limited to, mitigation of archaeological sites, artifact processing, writing a summary report of findings, writing the final report of findings, and curation of artifacts.

1. Ormat shall provide BLM with a letter assuring BLM that Ormat will fund all of the required work stipulated in the approved data recovery/treatment plan.

II. NOTICES TO PROCEED

A. BLM will provide Ormat with a Notice to Proceed after BLM and SHPO have the opportunity to review the mitigation to ensure compliance with the Historic Properties Treatment Plan, as agreed by SHPO and BLM. To ensure compliance, the following will be carried out:

1. The CRM firm hired by Ormat will provide BLM with a summary of field work after a property has been mitigated according to the Historic Properties Treatment Plan.

2. BLM shall review and approve the summary.

3. BLM shall provide a copy of the summary to SHPO.

4. SHPO shall review the summary. If SHPO does not respond within two working days, BLM can assume concurrence and issue the Notice to Proceed.

5. Ormat shall not begin any ground disturbing activities within the boundaries of any historic property until a Notice to Proceed is issued for the property.

6. Ormat shall be provided with the locations of historic properties listed above to ensure their avoidance until treatment. Ormat shall protect, secure and restrict access to this sensitive information.

B. Ormat shall arrange for and fund a CRM firm to monitor on an annual basis the remaining historic properties that have not undergone treatment. If the monitoring reveals that a historic property has experienced damage attributable to Ormat or their contractors, then Ormat shall hire a CRM firm to complete treatment at the damaged historic property to be initiated within the year.

III. DURATION

This MOA will expire within five (5) years from the date of its execution if all its stipulations are carried out. BLM may consult with all signatories prior to expiration in order to re-examine terms of the MOA, determine if those terms remain acceptable, and renew the MOA for another period of time not to exceed five (5) years. Or, at the time of expiration, and prior to work continuing on the undertaking, BLM shall either (a) execute a MOA pursuant to 36 CFR § 800.6, or (b) request, take into account, and respond to the comments of the Advisory Council on Historic Preservation (ACHP) under 36 CFR § 800.7. Prior to such time, BLM may consult with the other signatories to reconsider the terms of the MOA and amend it in accordance with Stipulation VII below. BLM shall notify the signatories as to the course of action it will pursue.

IV. POST-REVIEW DISCOVERIES

If potential historic properties are discovered or unanticipated effects on historic properties found, BLM shall implement additional treatment according to approved Historic Preservation Treatment Plan(s). Post-review discoveries must be avoided until BLM issues a Notice to Proceed.

V. MONITORING AND REPORTING

The CRM firm hired by Ormat to implement the treatment plan will provide BLM with progress reports as each phase of the treatment plan is completed. Such report shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in BLM's efforts to carry out the terms of this MOA.

VI. DISPUTE RESOLUTION

Should any signatory or concurring party to this MOA object at any time to any actions Proposed or the manner in which the terms of this MOA are implemented, BLM shall consult with such party to resolve the objection. If BLM determines that such objection cannot be resolved, BLM will:

A. Disputes Involving BLM and SHPO

1. BLM or SHPO may object to an action proposed or taken by the other pursuant to this agreement. When informal resolution is not effective or satisfactory, the objecting party shall notify the other party in writing of the objection. Within seven (7) calendar days following receipt of notification, the parties shall initiate a formal thirty (30) calendar day consultation period to resolve the objection. If the objection is resolved within this time frame, the parties shall proceed in accordance with the terms of that resolution.

2. If the objection is not resolved within this time frame, and the parties have not agreed to extend the consultation period, the BLM Deputy Preservation Officer (DPO) shall refer the objection to the BLM Preservation Board, which will provide the BLM State Director with its recommendations. If the State Director accepts the Board's recommendations, the State Director shall promptly notify the SHPO of such acceptance, provide a copy of the Board's recommendations, and afford SHPO thirty (30) calendar days following receipt of the notification to comment on the recommendations. If SHPO concurs with the Board's recommendations within this time frame, the State Director and SHPO shall proceed in accordance with the Board's recommendations to resolve the objection.

3. If either the State Director or SHPO rejects the Board's recommendations after a period of consideration not to exceed thirty (30) days, the State Director shall promptly notify the Board in writing of the rejection, and immediately thereafter submit the objection, including copies of all pertinent documentation, to the ACHP for comment. Within thirty (30) calendar days following receipt of any ACHP comments, the State Director shall make a final decision regarding resolution of the objection and in writing notify the Board, SHPO, and the ACHP of that decision. The objection shall thereupon be resolved. In reaching a final decision regarding the objection, the State Director shall take into account any comments received from the Board, SHPO, and ACHP pursuant to this stipulation.

B. Disputes by a Member of the Public or a Federally-recognized Indian tribe

1. If a Member of the Public or a Federally-recognized Indian tribe objects at any time in writing to the manner in which this MOA is being implemented, BLM shall consult with the objecting party for a period not to exceed thirty (30) days and, if the objecting party requests, with SHPO, to resolve the objection. If the objecting party and BLM resolve the objection within thirty (30) days, BLM shall proceed in accordance with the terms of that resolution. BLM should inform SHPO of any objections and the outcome of attempts at resolution within ten (10) days after the period of resolution has expired.

2. If the objection cannot be resolved, and if the objecting party has not requested review by the ACHP, the DPO shall refer the objection to the Preservation Board, which will provide the State Director and the objecting party with its recommendations for resolving the objection. If the State Director and the objecting party accept the Preservation Board's recommendations, the State Director shall proceed in accordance with these recommendations to resolve the objection.

3. If either the State Director or the objecting party rejects the Preservation Board's recommendations for resolving the objection, the State Director shall refer the objection to the ACHP. The State Director shall make a final decision regarding the resolution of the objection and shall in writing notify the Board, the objecting party, SHPO and the ACHP of that decision. The objection shall thereby be resolved. In reaching a final decision regarding the objection, the State Director shall take into account any comments received from the Board, the objecting party, SHPO, and the ACHP pursuant to this paragraph. Any objection filed pursuant to this paragraph shall not prevent BLM from proceeding with project planning; however, project implementation shall be deferred until the objection is resolved pursuant to the terms of this paragraph.

C. If objection is sent to the ACHP:

1. The ACHP shall provide BLM with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, BLM shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. BLM will then proceed according to its final decision.

2. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period; BLM may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, BLM shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the MOA, and provide them and the ACHP with a copy of such written response.

3. The BLM's responsibility to continue to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute remain unchanged.

VII. AMENDMENTS

This MOA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

VIII. TERMINATION

If any signatory to this MOA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation VII, above. If within thirty (30) days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other signatories.

Once the MOA is terminated, and prior to work continuing on the undertaking, BLM must either (a) execute an MOA pursuant to 36 CFR § 800.6, or (b) request, take into account,

and respond to the comments of the ACHP under 36 CFR § 800.7. BLM shall notify the signatories as to the course of action it will pursue.

EXECUTION of this MOA by BLM and SHPO, and implementation of its terms, evidence that BLM has taken into account the effects of this undertaking on historic properties.

SIGNATORIES:

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT

By: _____ Date: 6-8-11
David Overcast, Tuscarora Field Office Manager

NEVADA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date: 6-20-11
Ronald James, SHPO

CONCUR:

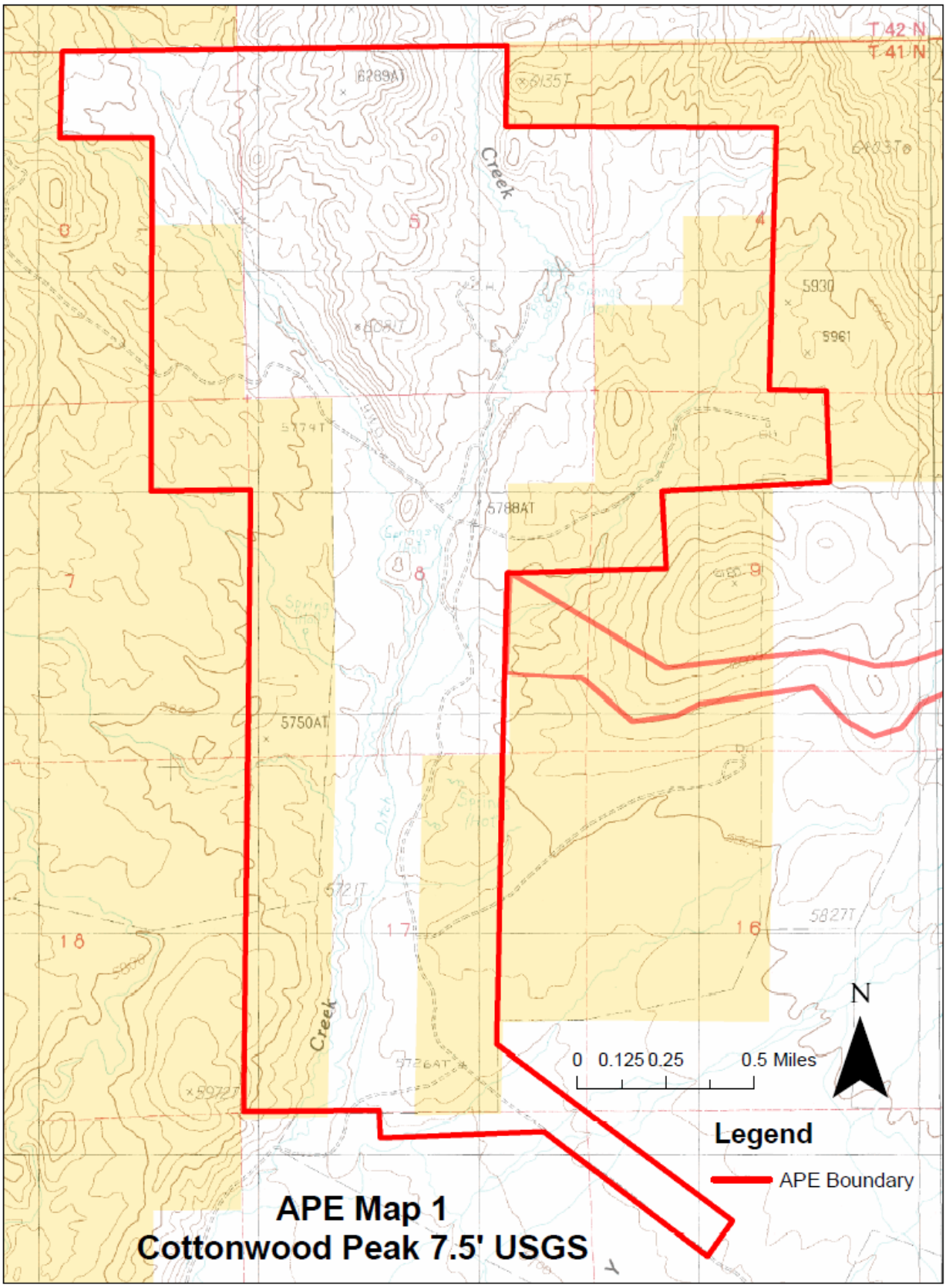
By: Connie Stechman Date: June 7, 2011
ORNI 42 LLC. & ORNI 49 LLC.

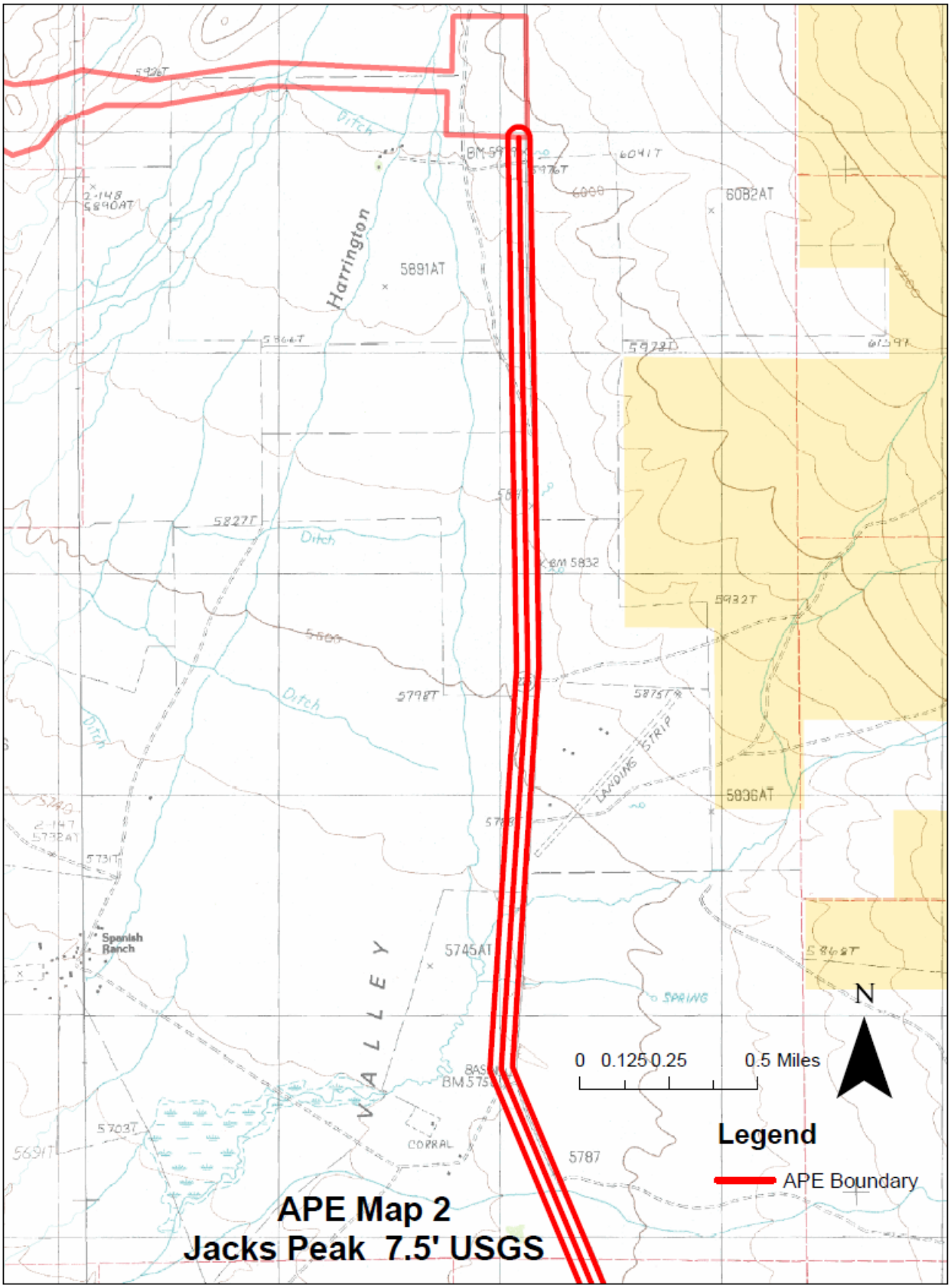
U.S. DEPARTMENT OF ENERGY, LOAN PROGRAMS OFFICE

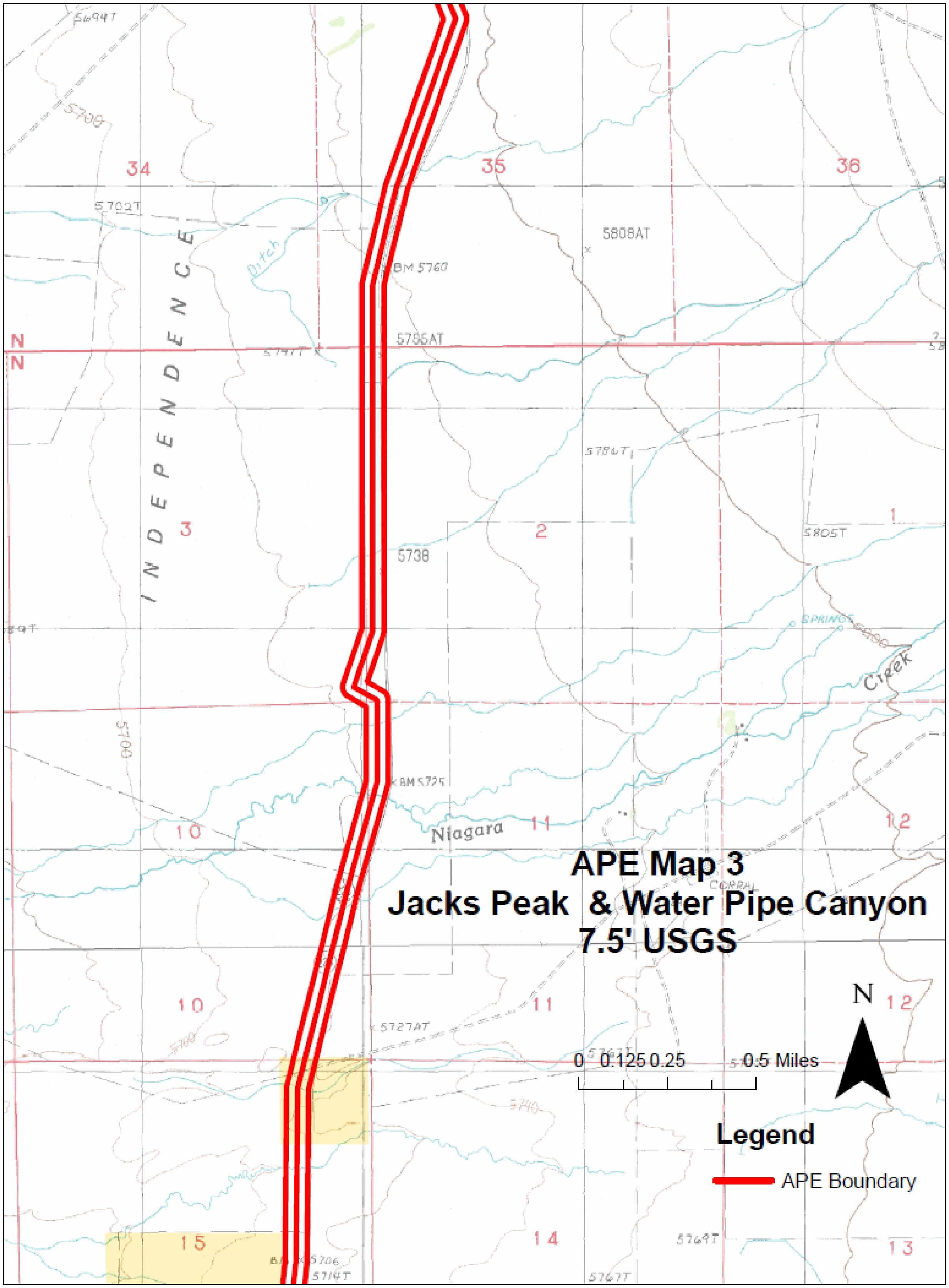
By: SR Thomas /for Date: June 6, 2011
Matthew McMillen, Director
Environmental Compliance Division

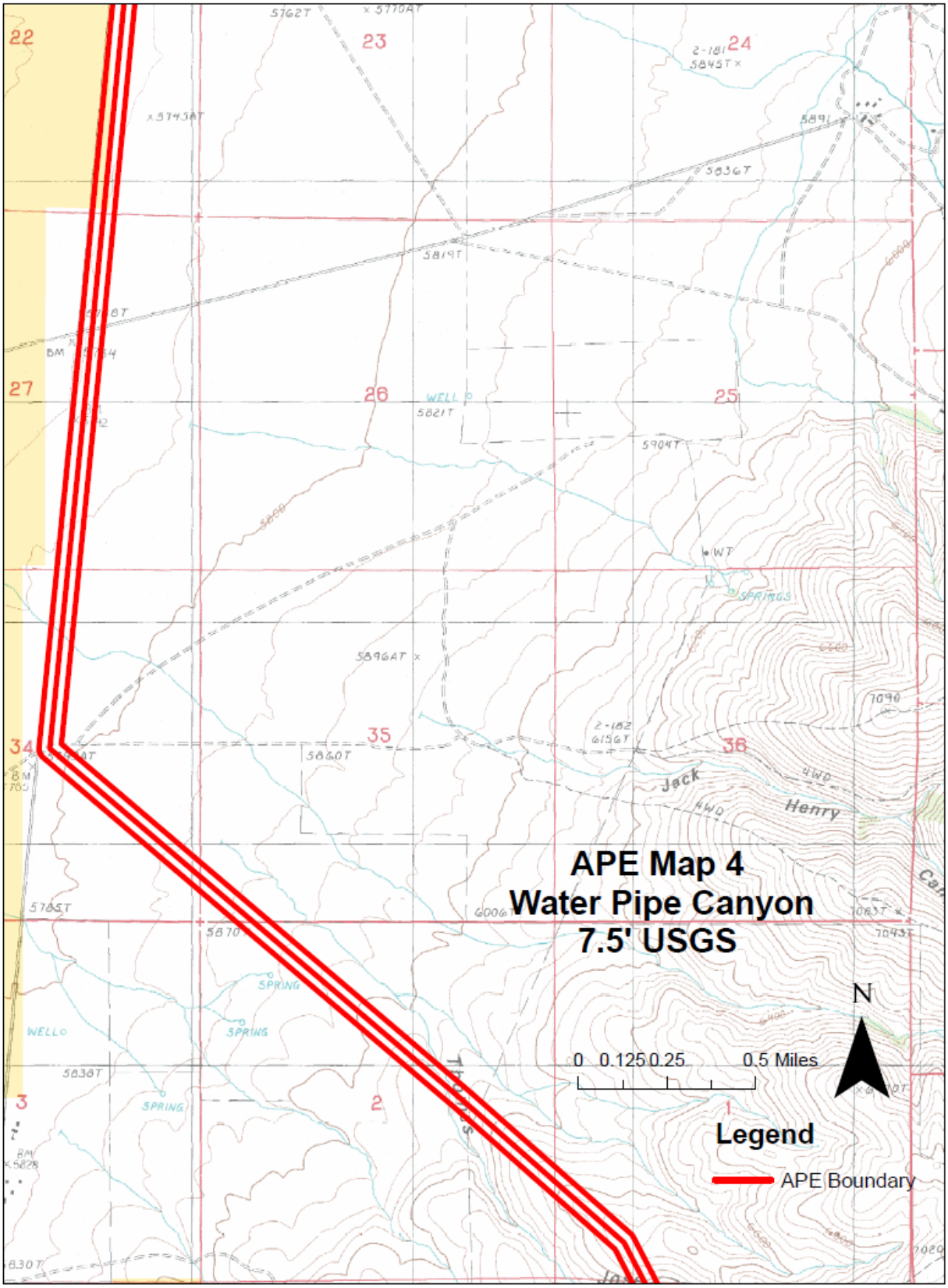
APPENDIX A: AREA OF POTENTIAL EFFECT (APE)

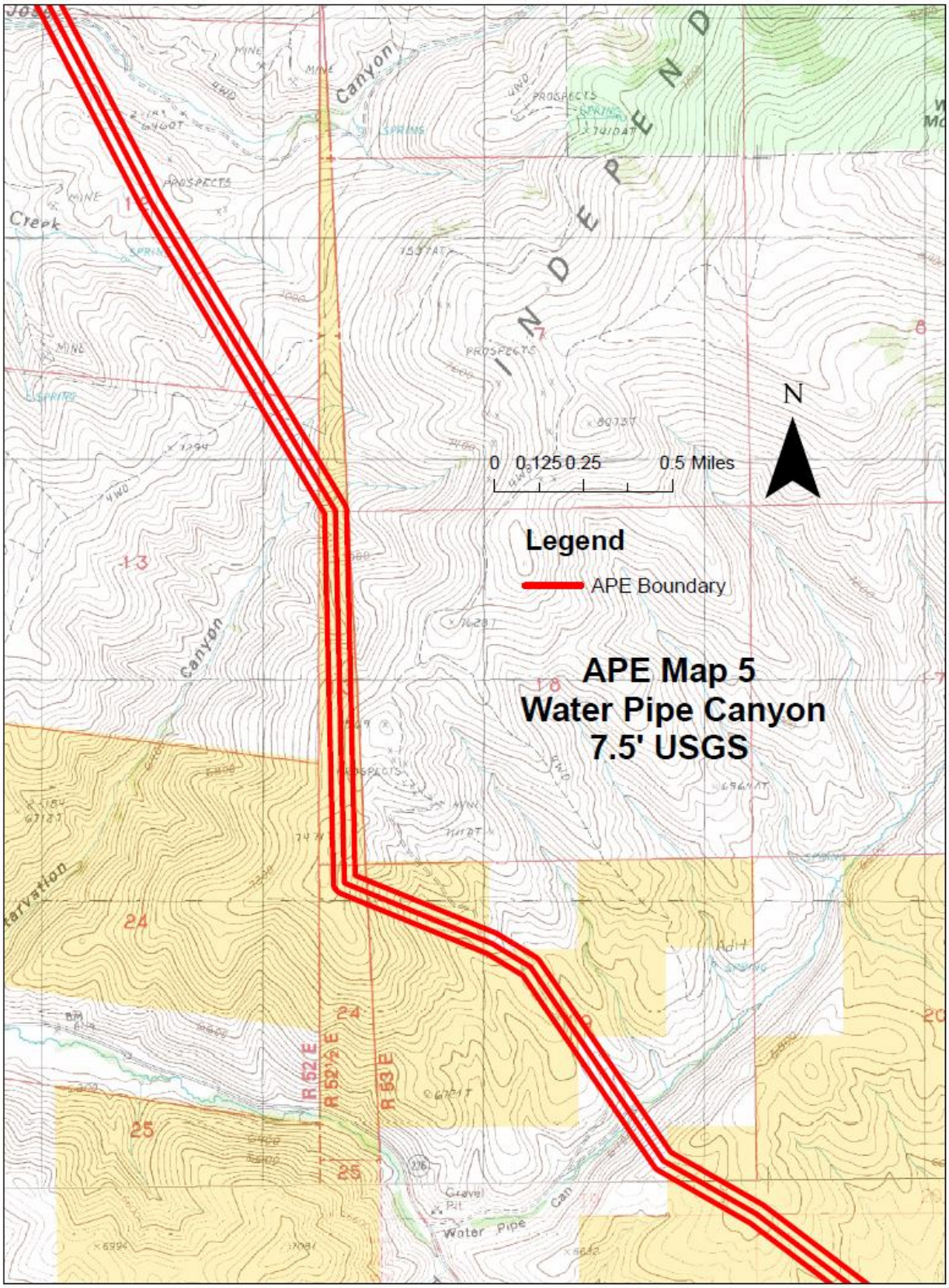
The APE includes the power plant, wells, pipelines, work/storage areas, power line and access road within the cumulative area outlined (with bold red line) on the 8 maps.

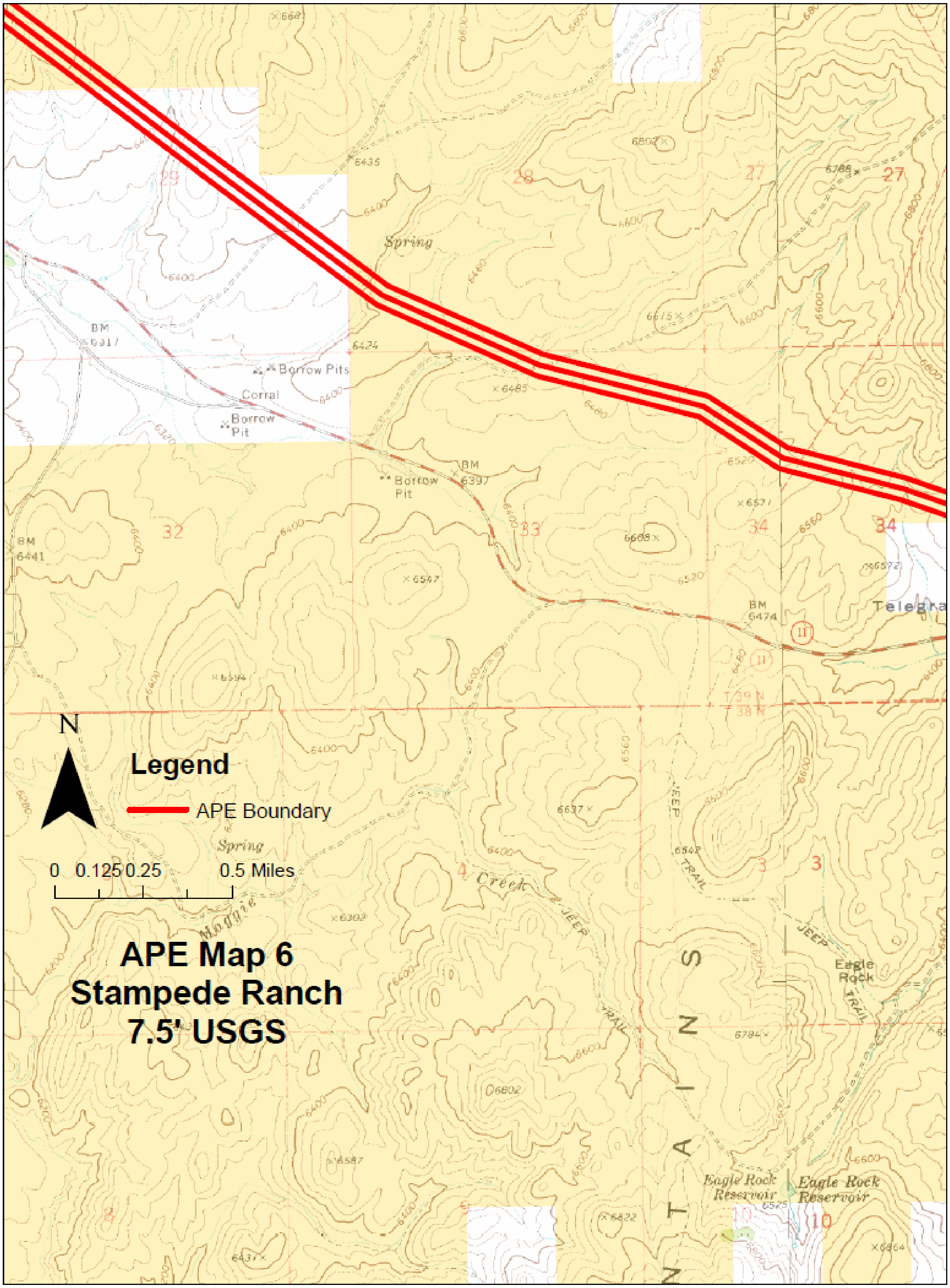

T 42 N
T 41 N
Creek
5930
5961
5788AT
5750AT
5827T
Creek
N
0 0.125 0.25 0.5 Miles
Legend
APE Boundary
APE Map 1
Cottonwood Peak 7.5' USGS

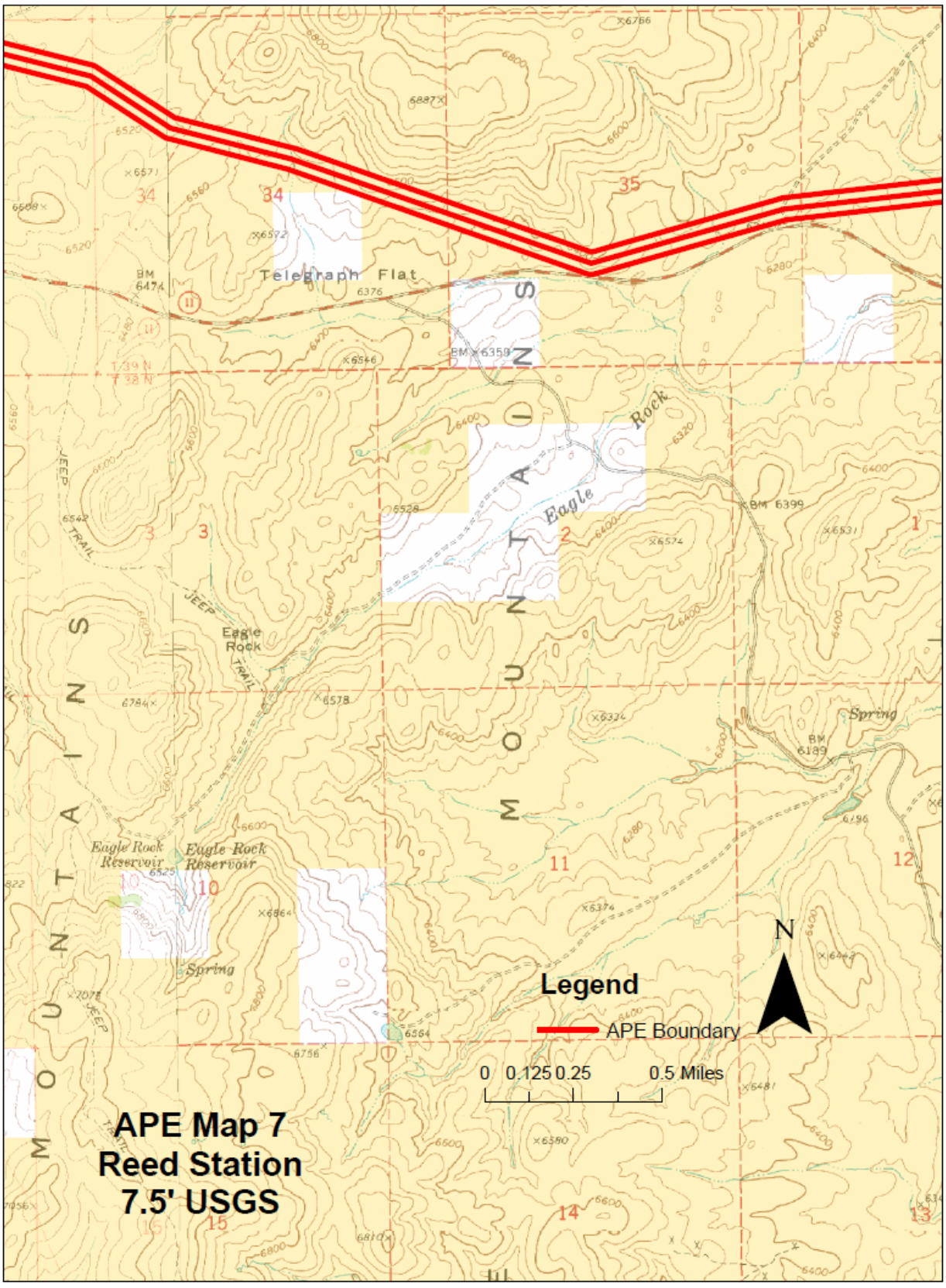

Harrington
5891AT
6082AT
5936AT
5745AT
Spanish Ranch
VALLEY
Ditch
LANDING STRIP
SPRING
CORRAL
0 0.125 0.25 0.5 Miles
N
Legend
APE Boundary
APE Map 2
Jacks Peak 7.5' USGS

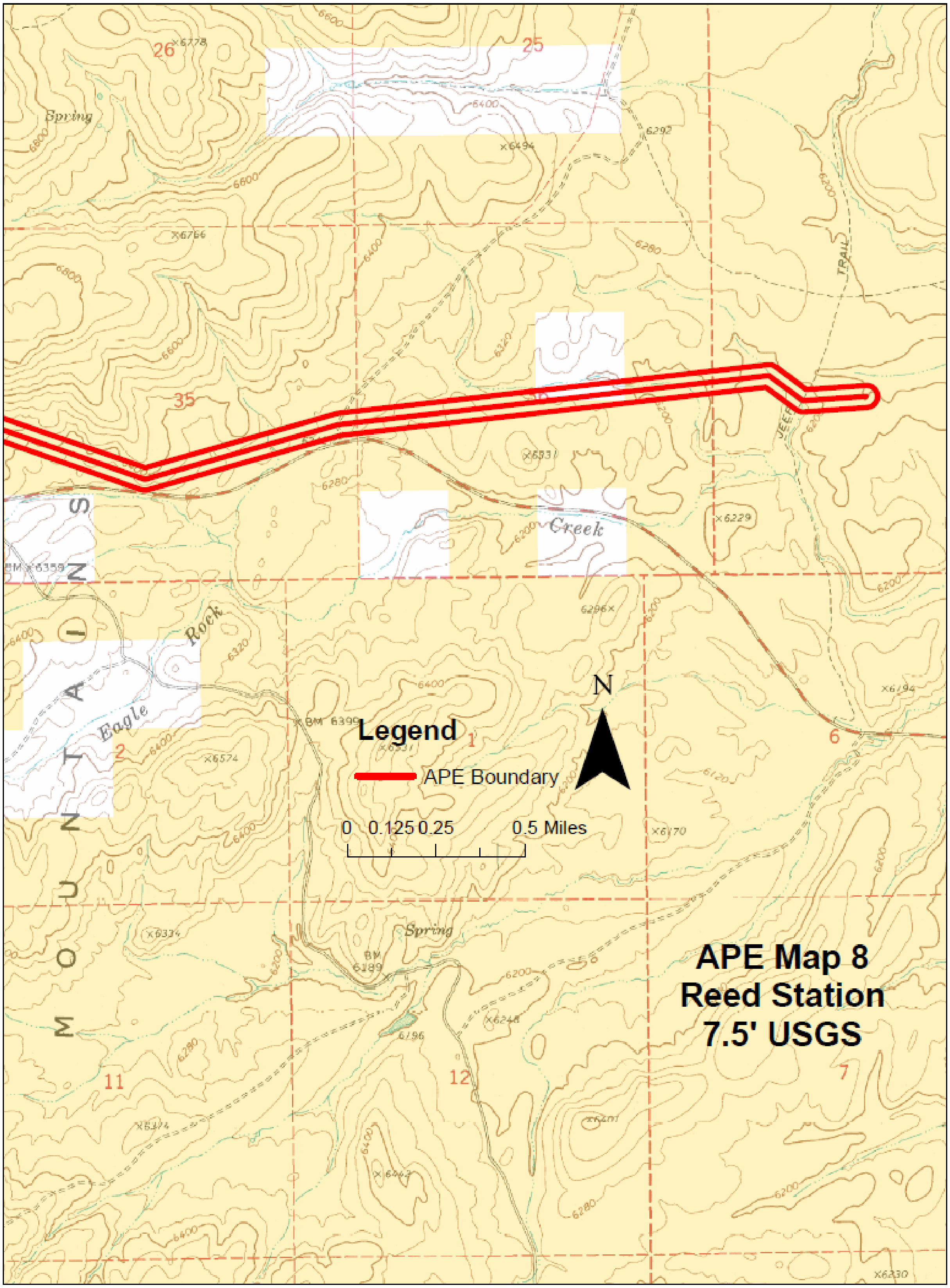

APE Map 3
Jacks Peak & Water Pipe Canyon
7.5' USGS
Legend
APE Boundary
N
0 0.125 0.25 0.5 Miles
34
35
36
3
2
1
10
11
12
15
14
13
INDEPENDENCE
Ditch
Niagara
Creek
SPRINGS
CORRAL
5702T
5808T
BM 5760
5755AT
5786T
5805T
5738
BM 5725
5727AT
5714T
5769T
5767T
5700
5740


APE Map 4
Water Pipe Canyon
7.5' USGS
N
0 0.125 0.25 0.5 Miles
Legend
APE Boundary
22
23
24
27
26
25
34
35
36
3
2
1
Jack
Henry
SPRING
WELL
SPRINGS


N
0 0.125 0.25 0.5 Miles
Legend
APE Boundary
APE Map 5
Water Pipe Canyon
7.5' USGS
INDEPEND
Canyon
Creek
Canyon
R 52 E
R 52½ E
R 53 E
Water Pipe
Gravel Pit


N
Legend
APE Boundary
0 0.125 0.25 0.5 Miles
APE Map 6
Stampede Ranch
7.5' USGS


Telegraph Flat
Eagle Rock
Eagle Rock Reservoir
Eagle Rock Reservoir
Spring
Spring
JEEP TRAIL
JEEP TRAIL
JEEP
BM 6474
BM 6359
BM 6399
BM 6189
T.39 N.
T.38 N.
MOUNTAINS
MOUNTAINS
N
Legend
APE Boundary
0 0.125 0.25 0.5 Miles
APE Map 7
Reed Station
7.5' USGS


Legend
APE Boundary
0 0.125 0.25 0.5 Miles
N
APE Map 8
Reed Station
7.5' USGS