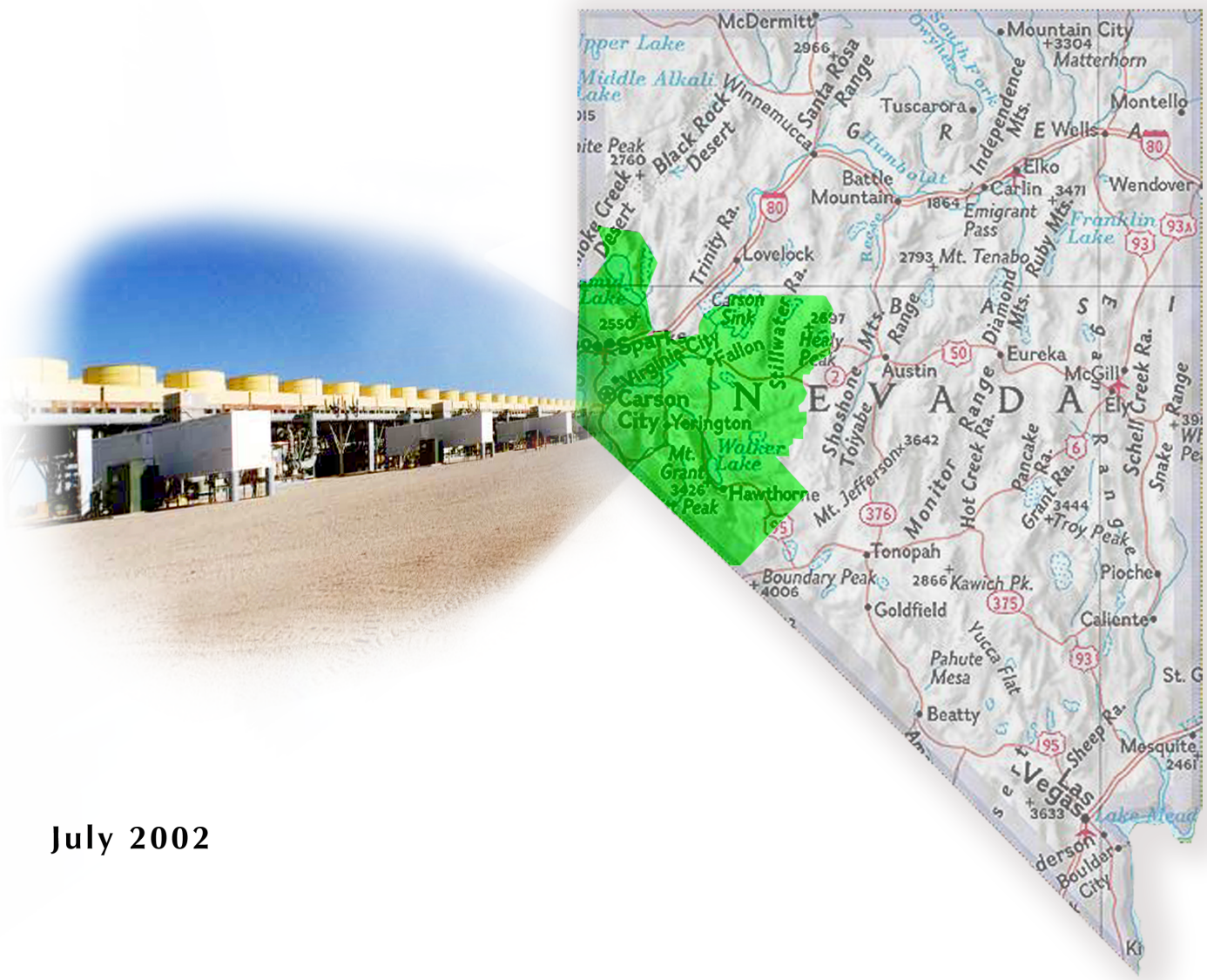
Environmental Assessment for Leasing of Geothermal Resources Managed by the Bureau of Land Management Carson City Field Office

EA-NV-030-02-021



July 2002

US Department of the Interior

Bureau of Land Management

Carson City Field Office

Bureau of Land Management Mission Statement

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. Resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic resources, and scientific and cultural values.

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1. INTRODUCTION / PURPOSE AND NEED

CHAPTER 1
INTRODUCTION/PURPOSE AND NEED

1.1 INTRODUCTION

This environmental assessment (EA) evaluates the impacts on the natural and human environment that could result from the Carson City Field Office (CCFO) of the Bureau of Land Management (BLM) issuing leases for geothermal resources. The EA is an analysis of impacts on the quality of the environment, serves as a vehicle for interdisciplinary review of the proposal and, if necessary, facilitates the preparation of an environmental impact statement (EIS). This document has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA, and the Federal Land Policy and Management Act of 1976 (FLPMA) and consistent with the CCFO Consolidated Resource Management Plan (CRMP).

The proposed action considered in this EA—issuing leases for geothermal resources—is considered a federal action and a commitment to resource development; it therefore requires NEPA analysis. While issuing a lease for geothermal resources confers on the lessee the right to future exploration and development of geothermal resources within the lease area, issuing a lease does not confer on the lessee the right to explore for or develop geothermal resources if such activities would extend beyond the level of casual use. As a result, the proposed issuance of geothermal leases would have no direct impacts.

Issuance of geothermal leases could have indirect impacts because such leasing represents a commitment of resources and it is reasonably expected that subsequent exploration, development, production, and closeout activities would occur. The EA therefore presents a broad scope analysis of the potential indirect and cumulative impacts from geothermal leasing to determine whether these indirect impacts by the lessee could be significant.

The CCFO has undertaken this EA to expedite the process of environmental review and approval of geothermal resource leasing in the CCFO management area. The

CCFO has chosen to prepare an EA because it can be completed more quickly than an EIS, and therefore leases may be approved more quickly. Leasing may be approved under an EA level of analysis only if no significant impacts would be expected to occur. In order to achieve this objective, the EA uses two separate screening protocols to determine which areas could be approved for future geothermal leasing under this EA by identifying those that would have a low potential for significant environmental impacts.

The first screening process identifies the areas that BLM may lease, in accordance with law or policy. This phase of the screening process is presented in sections 1.2 and 1.3 below. The second screening process identifies the areas that may be leased without a high risk of significant indirect impacts resulting from subsequent geothermal development activities. This resource analysis phase of the screening process is presented in the environmental analyses in chapters 3 and 4.

The NEPA decision for this EA will apply only to those lease areas that meet the standards of each screening process. Lease areas removed from consideration by the second screening process would require more extensive environmental analysis in the context of an environmental impact statement before leasing could be considered.

In addition to BLM-administered land, leasing is also proposed on land administered by the US Forest Service (USFS) and the US Bureau of Reclamation (Reclamation), thus these are the coordinating agencies in the preparation of this EA. Input has also been provided by key agencies or groups with special expertise, interest, or administrative responsibility pertaining to the general geographical area during the preparation of this EA; these include the US Fish and Wildlife Service (USFWS), the Bureau of Indian Affairs (BIA), various tribes (the Pyramid Lake Paiute, the Reno-Sparks Indian Colony, Yomba Shoshone, the Fallon Paiute-Shoshone, the Walker River Paiute, the Washoe Tribe of Nevada and California, and the Yerington Paiute), the Nevada Division of Wildlife (NDOW), the Nevada State Office of Historic Preservation, and Churchill, Washoe, Lyon, and Mineral counties in Nevada.

1.2 BACKGROUND FOR GEOTHERMAL RESOURCES AND LEASING

Geothermal resources are underground reservoirs of hot water or steam created by heat from the earth. Geothermal steam and hot water can reach the surface of the earth in the form of hot springs, geysers, mud pots, or steam vents. These resources also can be accessed by wells, and the heat energy can be used for generating electricity for other direct uses, such as heating greenhouses and aquaculture operations or for dehydrating vegetables.

It is the policy of the Department of the Interior, consistent with Section 2 of the Mining and Mineral Policy Act (MMPA) of 1970 and sections 102(a)(7), (8), and (12) of FLPMA, to encourage the development of mineral resources, including geothermal resources, on federal lands. The Geothermal Steam Act of 1970 (43 CFR Part 3200, et seq., as amended) provides regulatory guidance for geothermal leasing by BLM.

The first step in developing geothermal resources on federal lands is to issue a lease for geothermal development in a defined area. Leasing geothermal resources by BLM, as evaluated in this EA, confers on the lessee a right to future exploration and development of geothermal resources within the lease area. However, leasing geothermal resources does not confer on the lessee the right to conduct any ground-disturbing activities related to exploring for or developing geothermal resources. There are four stages of geothermal resource development within a lease, including exploration, development, production, and closeout. Each of the four stages under the lease requires separate BLM authorization and NEPA compliance when ground-disturbing activities are proposed.

A geothermal lease typically grants the lessee access to geothermal resources in the lease area for a period of 10 years. The terms of the lease require the lessee to show a certain level of diligence toward developing the geothermal resources within the lease area or the lease may be terminated. Once an area is developed for productive use of geothermal energy, the lease allows the lessee use of the resource for 40 years, with a right of renewal for another 40 years. Geothermal exploration and production on federal land conducted through leases is subject to terms and stipulations to comply with all applicable federal and state laws pertaining to various considerations for sanitation, water quality, wildlife, safety, and reclamation. Lease stipulations may be site-specific and are derived from the environmental analysis process.

Federal land may be leased for geothermal activities through either a noncompetitive or competitive process. Most public land may be leased through a noncompetitive lease granted to the first qualified offeror. Certain lands are designated as known geothermal resource areas (KGRAs) and are offered only through a competitive bid process. KGRAs are areas where BLM has determined, based on geologic and technical evidence, that a person with geothermal knowledge would spend money to develop geothermal resource, areas that are near wells capable of commercial production of geothermal fluids, or areas where there is a competitive interest in geothermal resource development (not a singular criteria for KGRA designation). The intent of the competitive lease approach is for the public to receive a fair market value for leasing the right to develop these resources. KGRAs are defined for a broad area that may include lands where BLM is not authorized to lease, such as private land, tribal land, and land administered by certain other agencies.

In accordance with the Geothermal Steam Act, BLM has leasing authority for geothermal resources on the following:

- Lands administered by the Department of the Interior, including public, withdrawn, and acquired lands;
- Lands administered by the Department of Agriculture, with its concurrence;
- Lands conveyed by the United States where the geothermal resources were reserved to the United States; and

- Lands subject to Section 24 of the Federal Power Act, as amended (16 U.S.C. 818), with concurrence from the Secretary of Energy.

However, the Geothermal Steam Act, policy established in the CCFO CRMP, and other established law or regulation preclude BLM from issuing geothermal leases in specific areas. BLM is prohibited from issuing leases on the following:

- Private land or land owned by the state of Nevada (in accordance with the Geothermal Steam Act);
- Wildlife management areas administered by the Department of the Interior (in accordance with the Geothermal Steam Act);
- Tribal lands (in accordance with the Geothermal Steam Act);
- Lands in southern Washoe County, except those within or adjacent to the Steamboat KGRA (in accordance with the Southern Washoe County Urban Interface Plan Amendment);
- Lands in the Carson Lake Pastures area (in accordance with the Truckee-Carson-Pyramid Lake Water Rights Settlement Act);
- The Grimes Point Archaeological Area (in accordance with CCFO CRMP); and
- Lands designated as Wilderness Areas or Wilderness Study Areas (WSAs), except where expressly permitted (in accordance with Geothermal Steam Act).

Lease applications, in accordance with provisions of the Geothermal Steam Act, are generally submitted for at least one full section of land, which is a mapped area of one square mile. Consequently, lease applications may be submitted for sections that include inholdings of land where BLM has no authority to lease. In such cases, BLM may still consider lease applications because it is not precluded from leasing the remaining land over which it has leasing authority. As a result, while lease applications may be submitted for more than one section, and while applications may be approved for less than one section, the section is the basic geographic unit for analysis in this EA.

1.3 CCFO LEASING OF GEOTHERMAL RESOURCES

As of May 1, 2002, 57 noncompetitive lease applications, covering approximately 121,000 acres, had been filed for geothermal resources within the CCFO management area. Additionally, approximately 30,000 acres of land in KGRAs within the CCFO management area were unleased and open for competitive sale. This EA considers those areas for which noncompetitive lease applications were submitted, or areas in KGRAs that were available for leasing, as of this date. Any additional noncompetitive lease applications that were submitted after this date are not evaluated in this EA, except as part of cumulative conditions, and would be subject to separate environmental review.

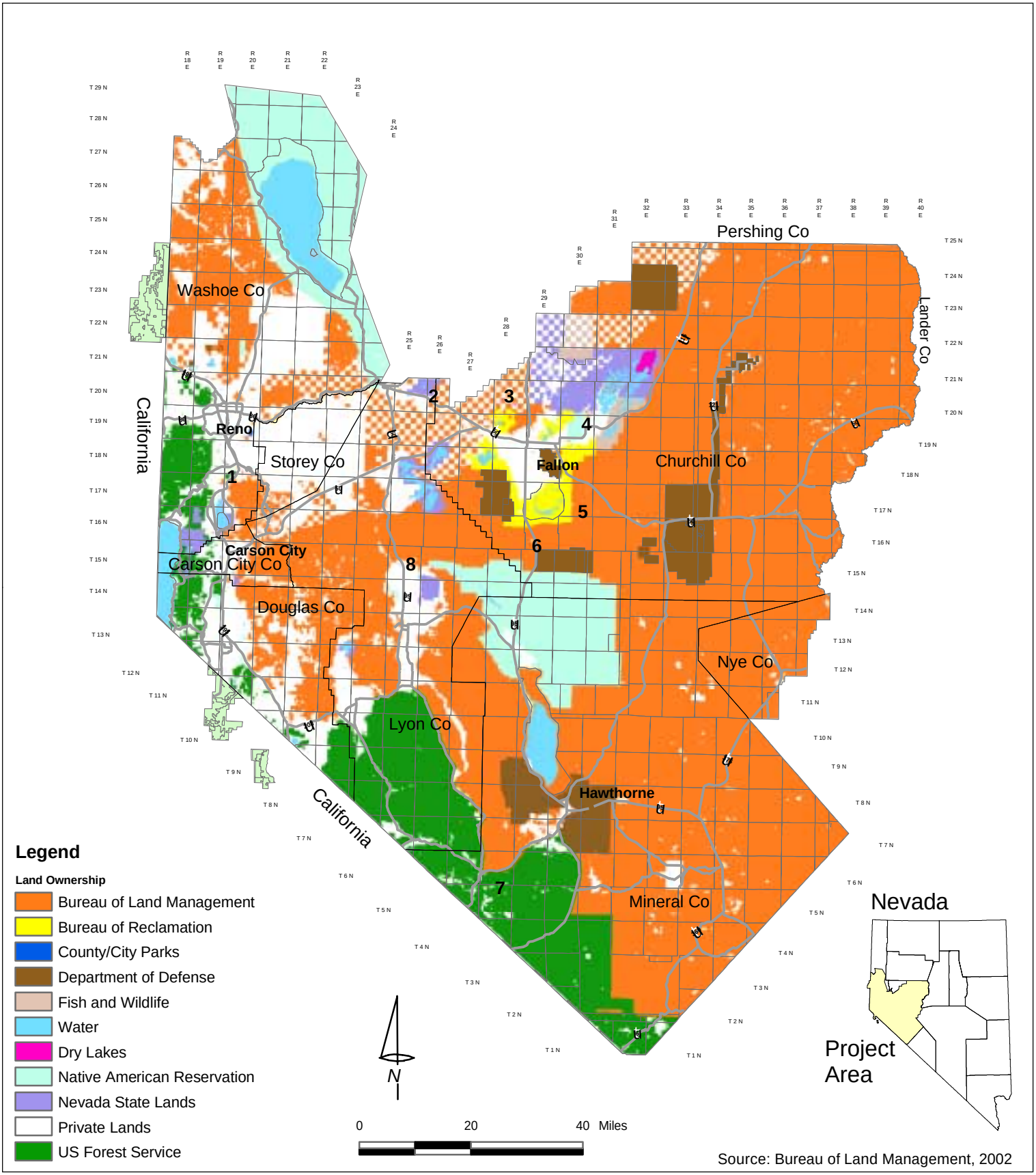
Of the 57 noncompetitive lease applications that were submitted to BLM by May 1, 2002, 15 were for sections of land for which BLM has no leasing authority; these sections are therefore not evaluated in this EA. (Appendix A contains a list of all noncompetitive lease applications, including the leasing authority conflict for those areas not considered in the EA.) Several lease applications for lands in the Steamboat area are not considered in the EA because the Southern Washoe County Urban Interface Plan Amendment precludes BLM from leasing. Lands within the KGRAs that are already leased or that are inconsistent with the authorities outlined above also cannot be offered for leasing and are not evaluated in this EA. Based on the legal, regulatory, and policy screening considerations outlined in Section 1.2, it was determined that BLM has leasing authority for approximately 65,000 acres, under 42 noncompetitive lease applications, in addition to the approximately 30,000 acres available within the KGRAs.

As noted above, with proper concurrence, BLM has leasing authority for certain lands administered by other federal agencies, including land administered by the USFS and lands withdrawn by Reclamation. The USFS (Humboldt Toiyabe National Forest) and Reclamation (Mid-Pacific Region) have been involved in developing this EA. Lands administered by these agencies that are within KGRAs or where noncompetitive lease applications have been submitted are considered in this EA, except where leasing is precluded by one of the authorities stated above or where USFS or Reclamation did not concur.

Of the total area available for leasing, it is possible that there would be a high risk of significant environmental impacts if after leasing, subsequent geothermal resource development were to occur in certain areas. Therefore, resource analysis presented in chapters 3 and 4 of this EA will serve as a second screening mechanism to determine which of the lease areas initially determined suitable for leasing could be leased without the potential for significant impacts to the environment. As part of its NEPA decision for this EA, BLM would not approve leasing in any area with a high potential for significant environmental impacts. More extensive environmental analysis, such as an EIS, would be required for these areas.

1.4 LOCATION OF THE PROPOSED ACTION

The BLM CCFO manages approximately 5.4 million acres of public land (Figure 1-1). Within the CCFO management area are five KGRAs: Steamboat, Hazen, Soda Lake, Stillwater, and Salt Wells (Figure 1-1). Noncompetitive lease applications that have been filed with the CCFO are within eight general areas. Five of these areas are adjacent to KGRAs: Steamboat, Hazen, Soda Lake, Stillwater, and Salt Wells (Figure 1-1). Noncompetitive lease applications have also been filed in three noncompetitive lease areas that are not associated with a KGRA: Lee Hot Springs, Aurora Crater, and Wabuska (Figure 1-1).



Source: Bureau of Land Management, 2002

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Legend

1 Steamboat
2 Hazen
3 Soda Lake
4 Stillwater
5 Salt Wells
6 Lee Hot Springs
7 Aurora Crater
8 Wabuska Hot Springs

KGRAs and Noncompetitive Lease Application Areas

Carson City Field Office, Nevada

Figure 1-1

Tetra Tech, Inc

1.5 PURPOSE OF THE PROPOSED ACTION

The purpose of the proposed action is to lease geothermal resources administered by the CCFO, including offering leases in KGRAs through competitive sale and approving noncompetitive lease applications within the CCFO management area.

President George W. Bush established the National Energy Policy Development Group and directed it to develop a national energy policy. This group created the National Energy Policy (NEP), a comprehensive set of legislative and administrative proposals, which the Bush Administration released in May 2001. The NEP specifically recommends that "the President direct the Secretary of the Interior to determine ways to reduce the delays in geothermal lease processing as part of the permitting review process."

On May 18, 2001, President Bush issued Executive Order (EO) 13212, Actions to Expedite Energy-Related Projects, which states "the increased production and transmission of energy in a safe and environmentally sound manner is essential." Executive departments and agencies are directed to "take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy." EO 13212 further states that "(f)or energy-related projects, agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining safety, public health, and environmental protections. The agencies shall take such actions to the extent permitted by law and regulation, and where appropriate."

In response to the NEP and EO 13212, BLM issued a National Energy Policy Implementation Plan in June 2001, which identified over 40 short- and long-term tasks for BLM to undertake to expedite or expand energy supplies, while preserving the health of the public lands.

1.6 NEED FOR THE PROPOSED ACTION

Because demand for energy in the United States has increased dramatically in a relatively short time, the level of exploration, development, and production of geothermal resources on BLM-administered lands needs to increase to help meet the increased energy demand. In accordance with this increased demand, the geothermal leasing policies of MMPA and FLPMA, and the directives of the NEP and EO 13212, BLM needs to expedite processing of pending noncompetitive geothermal lease applications and to offer competitive lease sales of geothermal resources within defined KGRAs, while continuing to maintain its responsibilities for safety, public health, and environmental protection.

1.7 CONFORMANCE STATEMENT

The proposed action is consistent with the CCFO CRMP and with other federal, state, and local laws, regulations, and plans to the maximum extent possible. The CRMP states that the desired outcome for minerals and energy management to "encourage

development of energy and mineral resources in a timely manner to meet national, regional, and local needs consistent with the objectives for other public land uses."

The CRMP further states that "Public lands in the Field Office area of jurisdiction are open to mineral and energy development activity with the following exceptions…" The areas proposed for geothermal leasing are not included in the excluded areas and are therefore open for geothermal development.

The proposed action is also consistent with the Toiyabe National Forest Plan. The Forest Plan, under subheading Forest Management Direction-Forest-Wide Standards and Guidelines, states that Toiyabe National Forest shall be managed to "encourage exploration and development of mineral resources and minimize possible adverse impacts on surface resources."

2. PROPOSED ACTION AND ALTERNATIVES

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

BLM proposes to approve 42 noncompetitive lease applications for approximately 64,000 acres, and to offer for competitive lease, 56 land sections within KGRAs totaling approximately 30,000 acres. A total of approximately 95,000 acres of land administered by BLM, Reclamation, or USFS would be offered or approved for geothermal leasing. The leasing areas where competitive and noncompetitive leases would be offered or approved and that constitute the proposed action are listed in Table 2-1 and shown on figures 2-1 through 2-8.

The Dixie Valley and Hazen KGRAs are within the management areas of both the Winnemucca and Carson City field offices. Geothermal leasing for all lands in the Dixie Valley KGRA is being evaluated by the Winnemucca field office and is not addressed in this EA. Geothermal leasing for all lands in the Hazen KGRA is addressed in this EA. As described in Chapter 1, noncompetitive lease applications that conflict with BLM leasing authority or policy are not evaluated in this EA.

As described in Chapter 1, issuance of geothermal leases confers on the lessee a right to future exploration and development of geothermal resources within the lease area. However, leasing geothermal resources does not confer on the lessee the right to proceed with any ground-disturbing activities related to exploring for or developing geothermal resources.

After a lease has been granted, it is reasonably foreseeable that the operator may propose subsequent exploration and development activities for BLM approval. These subsequent activities would each require BLM authorization and, if necessary, environmental review. For exploration activities, the operator must file an exploration permit that identifies, among many things, the areas to be explored and the method of exploration. When the operator has filed this permit with the local BLM office, the proposed action identified in the exploration permit undergoes NEPA review to

Table 2-1
Proposed Geothermal Lease Areas

Township / Range	Section	Lease Applicant (if applicable)	Serial Number (if applicable)	Approximate Area (Acres)
Steamboat KGRA and Noncompetitive Lease Area				
18N 19E	36	KGRA		640
18N 20E	34	KGRA		360
17N 19E	12	EVERGREEN ENERGY	NVN 074884	480
17N 20E	6	KGRA		590
17N 20E	8	EVERGREEN ENERGY	NVN 074884	480
Hazen KGRA and Noncompetitive Lease Area				
20N 25E	2	KGRA		640
	10	KGRA		640
	12	KGRA		550
	14	KGRA		640
	24	KGRA		190
20N 26E	4	KGRA		640
	6	KGRA		640
	8	KGRA		640
	10	KGRA		640
	16	KGRA		640
	18	KGRA		620
	20	KGRA		640
	22	KGRA		640
	28	KGRA		640
	30	KINGZETT JAMES M	NVN 075005	640
Soda Lake KGRA and Noncompetitive Lease Area				
19N 27E	2	HENKLE AND ASSOCIATES	NVN 075817	479
19N 28E	2	KGRA		640
	3	KGRA		160
	4	KGRA		280
	6	HENKLE AND ASSOCIATES	NVN 075816	
	8	HENKLE AND ASSOCIATES	NVN 075816	300
	10	HENKLE AND ASSOCIATES	NVN 075816	
20N 27E	36	KGRA		320
20N 28E	2	KGRA		640
	4	KGRA		640
	8	KGRA		640
	10	KGRA		640
	12	KGRA		640
	14	KGRA		640
	16	KGRA		640
	18	KGRA		160

Table 2-1
Proposed Geothermal Lease Areas *(continued)*

Township / Range	Section	Lease Applicant (if applicable)	Serial Number (if applicable)	Approximate Area (Acres)
	24	KGRA		640
	25	KGRA		640
	26	KGRA		640
	35	KGRA		320
	36	KGRA		640
20N 29E	27	KGRA		360
	28	KGRA		320
	29	KGRA		640
	30	KGRA		630
	31	KGRA		620
	32	KGRA		560
	33	KGRA		520
	34	KGRA		80
21N 28E	24	KGRA		640
	26	KGRA		640
	34	KGRA		640
	36	KGRA		400
Stillwater KGRA				
19N 30E	5	KGRA		640
	25	KGRA		640
	26	KGRA		40
	35	KGRA		560
	36	KGRA		640
20N 30E	35	KGRA		240
Salt Wells KGRA and Noncompetitive Lease Area				
16N 30E	1	VULCAN ENERGY	NVN 066737	640
	1	NGP POWER CORP	NVN 074723	640
	2	VULCAN ENERGY	NVN 066737	640
	2	NGP POWER CORP	NVN 074723	640
	3	VULCAN ENERGY	NVN 066737	640
	3	NGP POWER CORP	NVN 074723	640
	4	NGP POWER CORP	NVN 074717	1324
	9	NGP POWER CORP	NVN 074717	
	10	NGP POWER CORP	NVN 074718	
	11	NGP POWER CORP	NVN 074718	1920
	12	NGP POWER CORP	NVN 074718	
16N 31E	6	NGP POWER CORP	NVN 074714	1312
	7	NGP POWER CORP	NVN 074714	
17N 30E	1	NGP POWER CORP	NVN 074706	2404
	2	NGP POWER CORP	NVN 074706	
	3	NGP POWER CORP	NVN 074706	
	4	NGP POWER CORP	NVN 074706	

Table 2-1
Proposed Geothermal Lease Areas *(continued)*

Township / Range	Section	Lease Applicant (if applicable)	Serial Number (if applicable)	Approximate Area (Acres)
	5	NGP POWER CORP	NVN 074707	480
	8	NGP POWER CORP	NVN 074707	640
	9	NGP POWER CORP	NVN 074708	640
	10	NGP POWER CORP	NVN 074708	640
	11	NGP POWER CORP	NVN 074708	640
	12	NGP POWER CORP	NVN 074708	640
	13	NGP POWER CORP	NVN 074709	640
	14	NGP POWER CORP	NVN 074709	640
	15	VULCAN ENERGY	NVN 066738	640
	15	NGP POWER CORP	NVN 074721	640
	16	NGP POWER CORP	NVN 074709	640
	17	NGP POWER CORP	NVN 074709	640
	21	NGP POWER CORP	NVN 074710	640
	22	VULCAN ENERGY	NVN 066738	640
	22	NGP POWER CORP	NVN 074721	640
	23	KGRA		620
	24	KGRA		640
	25	KGRA		640
	26	KGRA		640
	27	VULCAN ENERGY	NVN 066738	640
	27	NGP POWER CORP	NVN 074721	640
	28	NGP POWER CORP	NVN 074711	640
	33	NGP POWER CORP	NVN 074712	640
	34	VULCAN ENERGY	NVN 066738	640
	34	NGP POWER CORP	NVN 074722	640
	35	VULCAN ENERGY	NVN 066739	640
	35	NGP POWER CORP	NVN 074722	640
	36	VULCAN ENERGY	NVN 066739	640
	36	NGP POWER CORP	NVN 074722	640
17N 31E	20	HENKLE AND ASSOCIATES	NVN 075609	640
	29	HENKLE AND ASSOCIATES	NVN 075815	640
	30	NGP POWER CORP	NVN 074713	1272
	31	NGP POWER CORP	NVN 074713	
	32	HENKLE AND ASSOCIATES	NVN 075815	640
18N 30E	19	NGP POWER CORP	NVN 074715	
	20	NGP POWER CORP	NVN 074715	2358
	29	NGP POWER CORP	NVN 074715	
	30	NGP POWER CORP	NVN 074715	
	28	NGP POWER CORP	NVN 074716	
	31	NGP POWER CORP	NVN 074716	2482
	32	NGP POWER CORP	NVN 074716	
	33	NGP POWER CORP	NVN 074716	

Table 2-1
Proposed Geothermal Lease Areas *(continued)*

Township / Range	Section	Lease Applicant (if applicable)	Serial Number (if applicable)	Approximate Area (Acres)
Lee Hot Springs Noncompetitive Lease Area				
15N 29E	4	VULCAN ENERGY	NVN 074255	640
	5	VULCAN ENERGY	NVN 074255	640
	8	VULCAN ENERGY	NVN 074255	640
	9	VULCAN ENERGY	NVN 074255	640
	16	VULCAN ENERGY	NVN 074256	640
	17	VULCAN ENERGY	NVN 074256	640
	20	VULCAN ENERGY	NVN 074256	640
	21	VULCAN ENERGY	NVN 074256	640
16N 29E	19	VULCAN ENERGY	NVN 074257	640
	20	VULCAN ENERGY	NVN 074257	640
	21	VULCAN ENERGY	NVN 074257	640
	22	VULCAN ENERGY	NVN 074257	640
	23	VULCAN ENERGY	NVN 074258	640
	26	VULCAN ENERGY	NVN 074258	640
	27	RON BARR	NVN 073930	640
	28	RON BARR	NVN 073679	640
	28	VULCAN ENERGY	NVN 074259	640
	29	VULCAN ENERGY	NVN 074258	640
	30	VULCAN ENERGY	NVN 074258	640
	31	VULCAN ENERGY	NVN 074259	640
	32	VULCAN ENERGY	NVN 074259	640
	33	RON BARR	NVN 073679	640
	33	VULCAN ENERGY	NVN 074259	640
	34	RON BARR	NVN 073930	640
	35	VULCAN ENERGY	NVN 074260	640
Aurora Crater Noncompetitive Lease Area				
5N 28E	2	VULCAN ENERGY	NVN 074249	640
	3	VULCAN ENERGY	NVN 074249	640
	4	VULCAN ENERGY	NVN 074249	640
	5	VULCAN ENERGY	NVN 074249	640
	9	VULCAN ENERGY	NVN 074250	640
	10	VULCAN ENERGY	NVN 074250	640
	11	VULCAN ENERGY	NVN 074250	640
	15	VULCAN ENERGY	NVN 074250	640
	16	VULCAN ENERGY	NVN 074251	640
6N 28E	13	VULCAN ENERGY	NVN 074252	640
	14	VULCAN ENERGY	NVN 074252	640
	22	VULCAN ENERGY	NVN 074252	640
	23	VULCAN ENERGY	NVN 074252	640
	24	VULCAN ENERGY	NVN 074253	640
	26	VULCAN ENERGY	NVN 074253	640
	27	VULCAN ENERGY	NVN 074253	640

Table 2-1
Proposed Geothermal Lease Areas *(continued)*

Township / Range	Section	Lease Applicant (if applicable)	Serial Number (if applicable)	Approximate Area (Acres)
	28	VULCAN ENERGY	NVN 074253	640
	32	VULCAN ENERGY	NVN 074254	640
	33	VULCAN ENERGY	NVN 074254	640
	34	VULCAN ENERGY	NVN 074254	640
	35	VULCAN ENERGY	NVN 074254	640
Wabuska Noncompetitive Lease Area				
15N 25E	10	TOWNSEND DONALD GORDON	NVN 074953	320
	11	DONALD G TOWNSEND	NVN 074899	2240
	12	DONALD G TOWNSEND	NVN 074899	
	13	DONALD G TOWNSEND	NVN 074899	
	14	DONALD G TOWNSEND	NVN 074899	
	15	DONALD G TOWNSEND	NVN 074901	640
	16	DONALD G TOWNSEND	NVN 074901	
	17	DONALD G TOWNSEND	NVN 074900	400
	22	TOWNSEND DONALD GORDON	NVN 074953	880
	23	TOWNSEND DONALD GORDON	NVN 074953	
		Total Area Proposed for Leasing (Approximate)		**94,260**

determine if there are any environmental conflicts in the area to be disturbed. If so, the BLM may, at its discretion, approve the permit, disapprove the permit, or modify the permit by requiring additional mitigating measures. Should the operator not be willing to accept the decision, the permit can be modified and resubmitted, or the decision can be appealed.

The development phase occurs when the operator has located a potentially economic geothermal reservoir. The operator must file an operations plan, which describes how an operator will drill for and test the geothermal resources covered by the lease. The action proposed in the operations plan would undergo NEPA review by the local BLM office to evaluate the possible environmental impacts of the action. If environmental conflicts are likely to occur, the BLM may again approve, modify, or disapprove the plan.

Barring abandonment of exploration and development wells, the final phase of this process is the creation of, for example, geothermal power plants or dehydration plants. After the appropriate paperwork is filed with the local BLM office, the proposed action undergoes NEPA review to evaluate the potential for environmental impacts and once again undergoes the approval process.

All decisions to approve or disapprove either an application or a plan are subject to appeal, either by the proponent or by affected interests. An appropriate level of public scoping, to include contacting affected interests, will be done as part of the NEPA

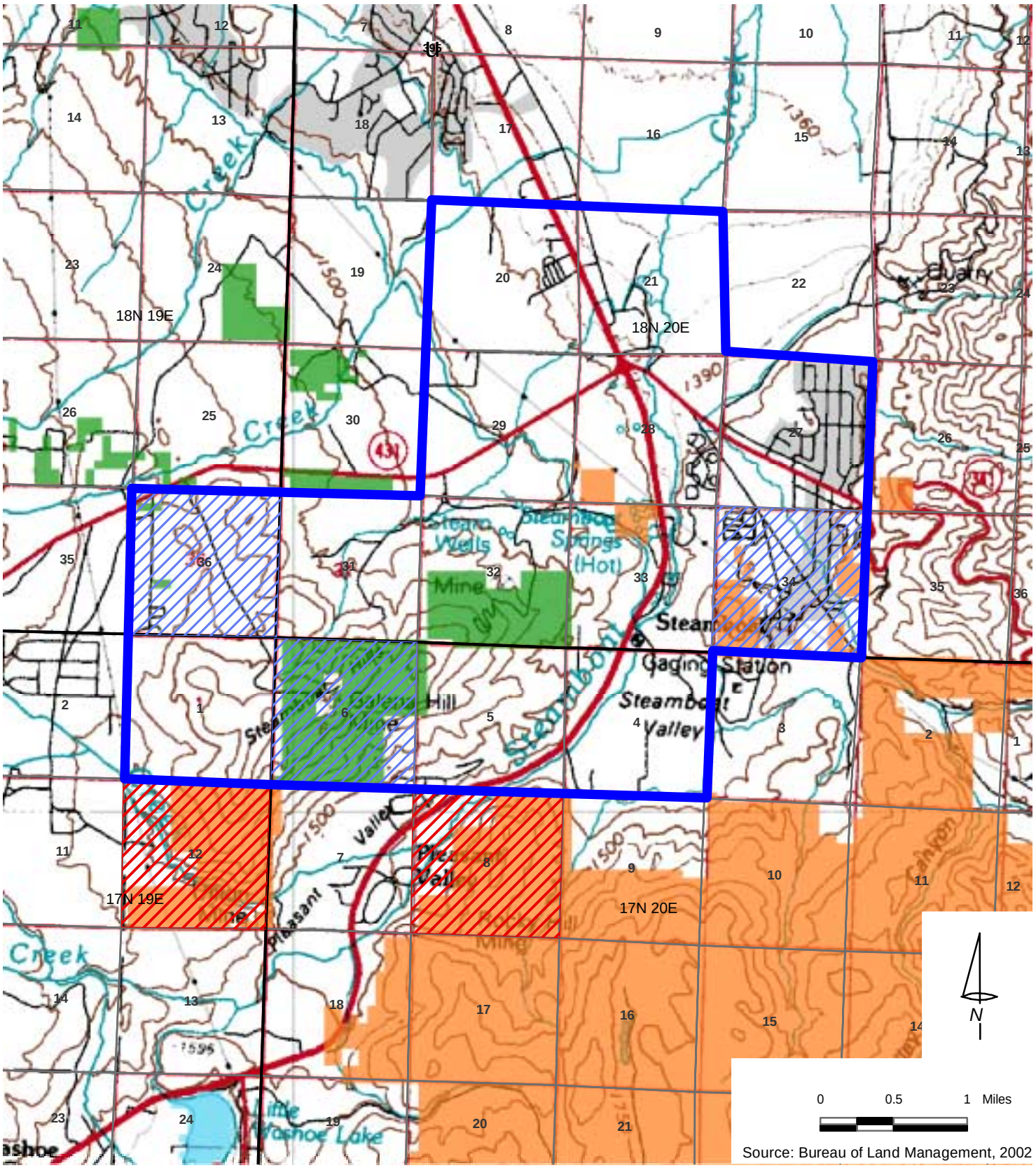
review. Decisions to approve an application or plan generally include mitigating measures as conditions of environmental clearance or permit approval in order to minimize adverse impacts to other resources. Standard Operating Procedures (SOPs) specified in the CCFO CRMP provide for modification or restriction on leasing as part of environmental review or permit approval (see Appendix D). Typical measures that could be required for any permit approval or environmental clearance are listed in Appendix D. These measures are not conditions of leasing and part of the proposed action. It is assumed that BLM would require such mitigating measures for all subsequent geothermal exploration, development, operation or closeout activities and that the potential indirect impacts of the proposed leasing action would therefore be mitigated in part by these measures.

Measures that are recommended to be conditions of leasing are presented in Appendix E Lease Stipulations. Lease stipulations are conditions of leasing that are designed to mitigate potential impacts from geothermal exploration, development, operation, or closeout in the CCFO management area. Recommended lease stipulations are assumed to be part of the proposed action.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, no areas would be offered or approved for geothermal leasing. Geothermal leasing would continue as at present and would be guided by the CCFO CRMP (BLM 2001b) and the regional environmental analyses for geothermal leasing in the Fort Churchill-Clan-Alpine area (BLM 1974a), Mina area (BLM 1974b), Pine Nut-Walker area (BLM 1974c), and Pyramid area (BLM 1974d). EAs or EISs would be required for each geothermal lease application in order to augment the outdated stipulations associated with the 1974 geothermal regional assessments. There would be no change in the actual permitted action from that of the proposed action.

The No Action Alternative would not permit further geothermal leasing and would be inconsistent with the intent of the Steam Act, the national energy policy, and EO 13212, which state that agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects. The No Action Alternative serves as a benchmark against which proposed action is evaluated.



Source: Bureau of Land Management, 2002

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Figure does not show sections for which lease applications were filed but where BLM has no leasing authority.

Legend

- KGRA Boundary
- KGRA Area Open to Competitive Lease
- Noncompetitive Lease Applications

Land Ownership

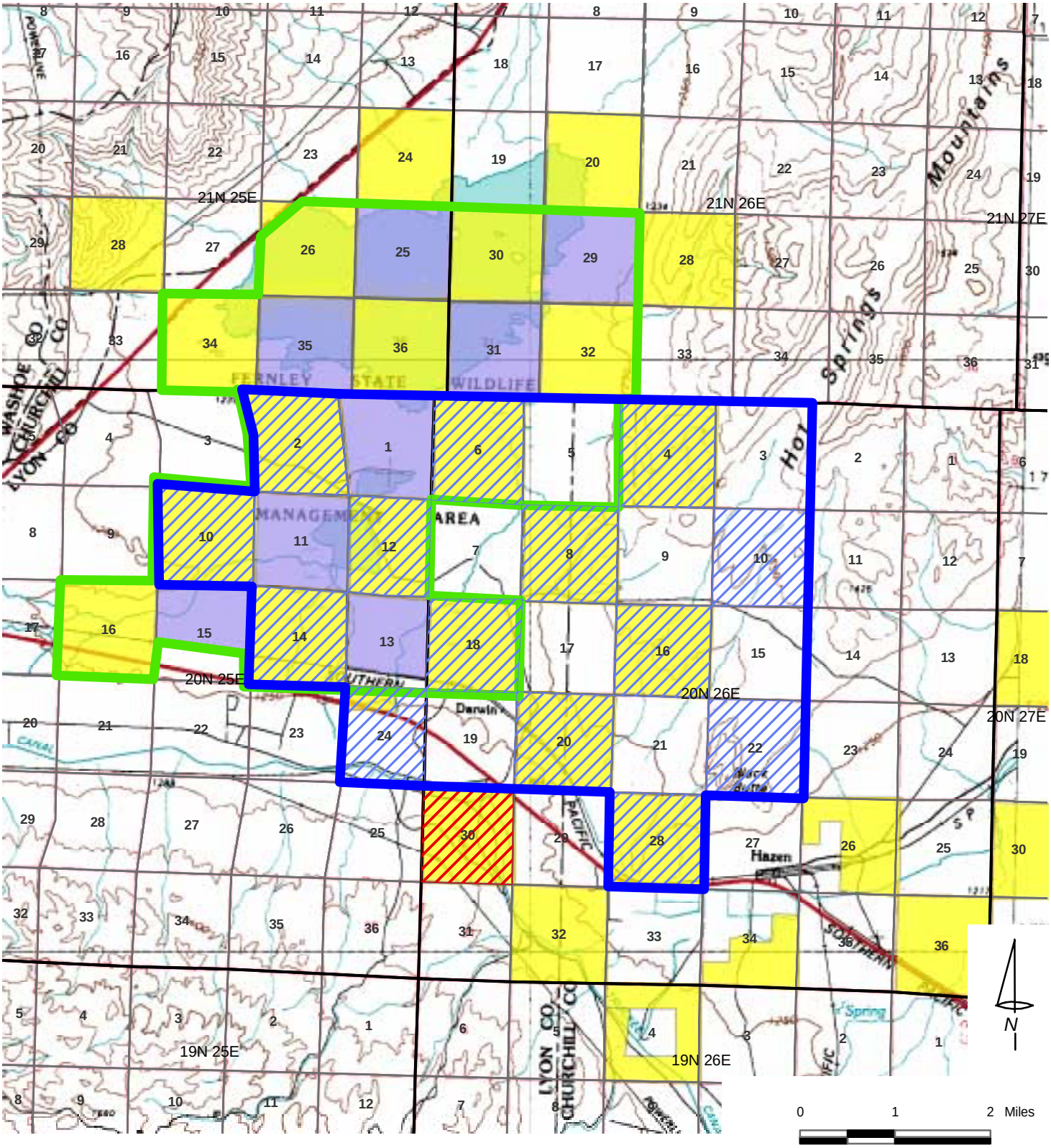
- Bureau of Land Management
- US Forest Service
- Private Lands
- Water

Steamboat KGRA and Noncompetitive Lease Area

Carson City Field Office, Nevada

Figure 2-1

Tetra Tech, Inc



Source: Bureau of Land Management, 2002

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Figure does not show sections for which lease applications were filed but where BLM has no leasing authority.

Legend

- KGRA Boundary
- KGRA Area Open to Competitive Lease
- Noncompetitive Lease Application
- Fernley Wildlife Management Area

Landuse

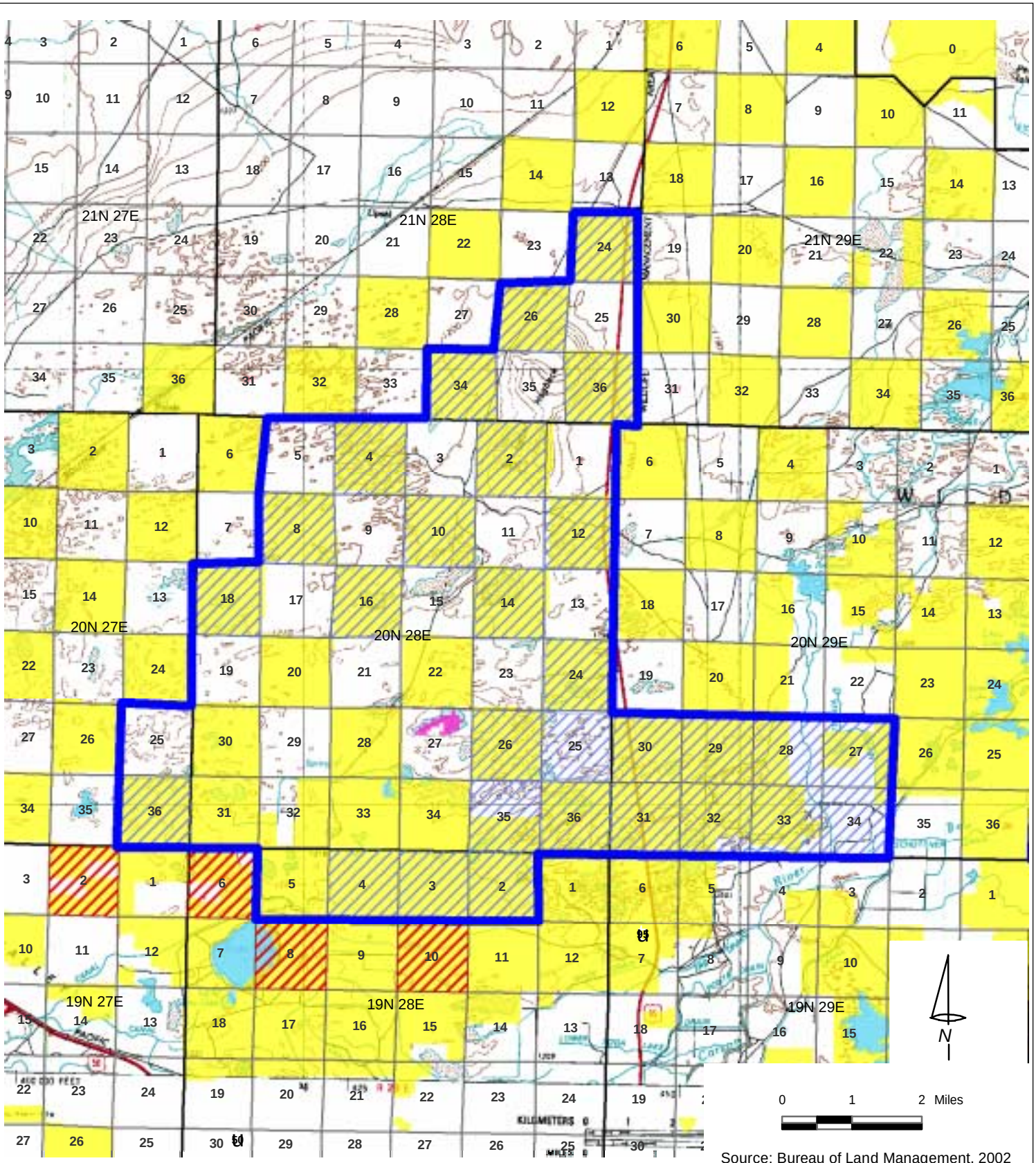
- Bureau of Reclamation
- Nevada State Lands
- Private Lands
- Water

Hazen KGRA and Noncompetitive Lease Area

Carson City Field Office, Nevada

Tetra Tech, Inc

Figure 2-2



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Legend

- KGRA Boundary
- KGRA Area Open to Competitive Lease
- Noncompetitive Lease Applications

Land Ownership

- Bureau of Reclamation
- Private Lands
- Water
- Dry Lakes

Soda Lake KGRA and Noncompetitive Lease Area

Carson City Field Office, Nevada

Figure 2-3

Tetra Tech, Inc

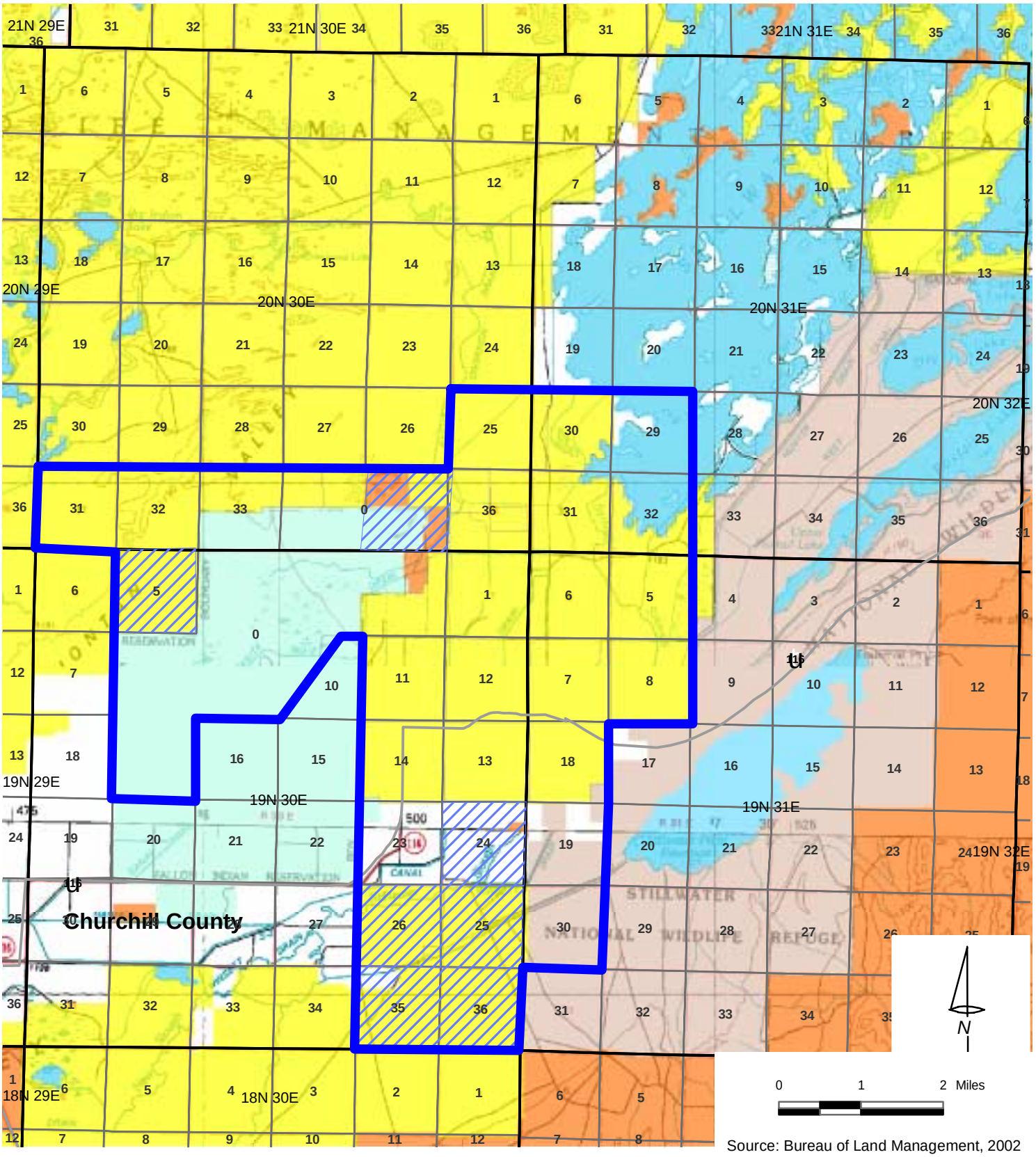

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Figure does not show sections for which lease applications were filed but where BLM has no leasing authority.

Legend

- KGRA Boundary
- KGRA Area Open to Competitive Lease

Land Ownership

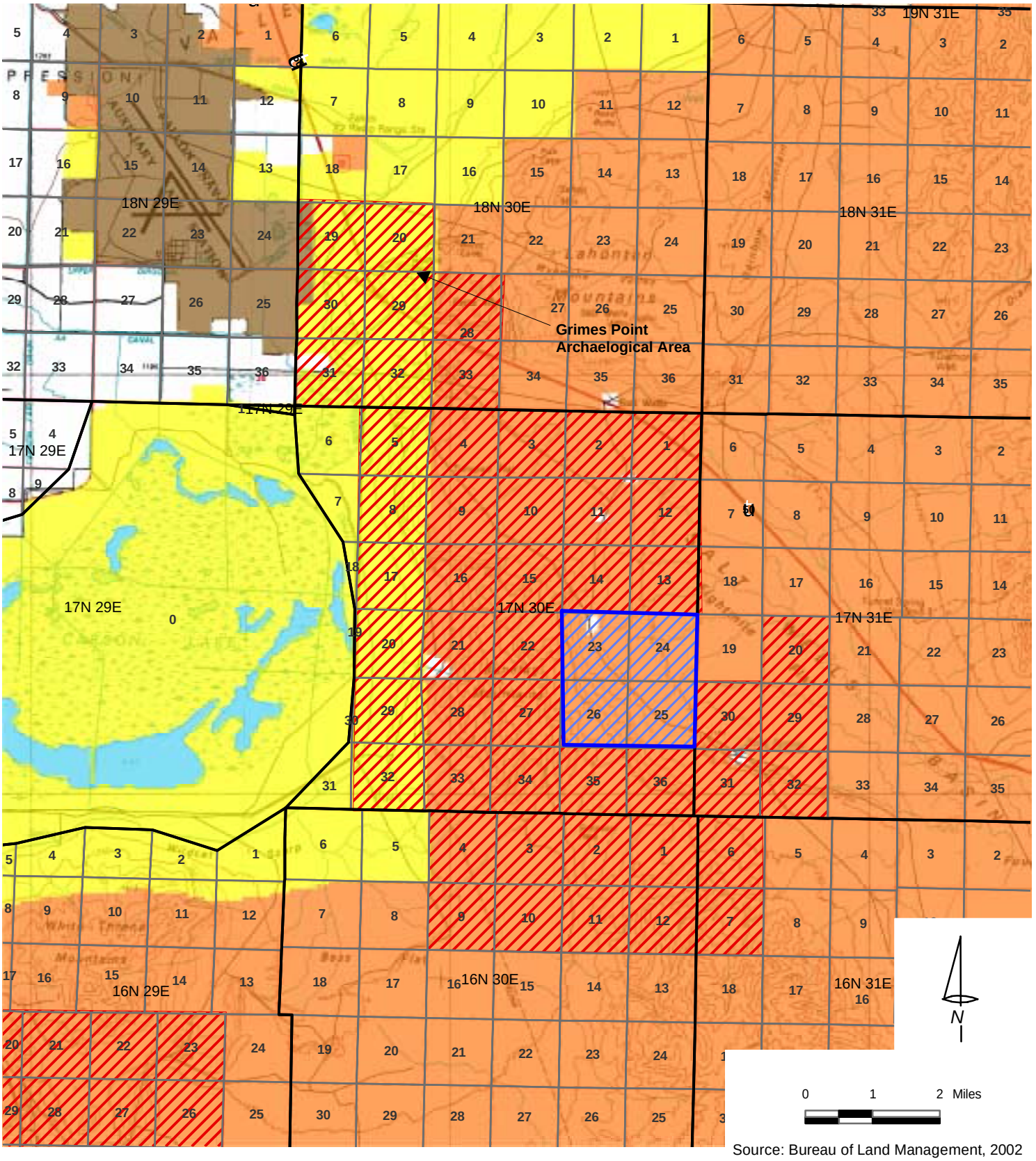
- Bureau of Land Management
- Bureau of Reclamation
- US Fish and Wildlife Service
- Native American Reservation
- Private Lands
- Water

Stillwater KGRA

Carson City Field Office, Nevada

Figure 2-4

Tetra Tech, Inc



Source: Bureau of Land Management, 2002

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Figure does not show sections for which lease applications were filed but where BLM has no leasing authority.

Legend

- KGRA Boundary
- KGRA Area Open to Competitive Lease
- Noncompetitive Lease Applications

Land Ownership

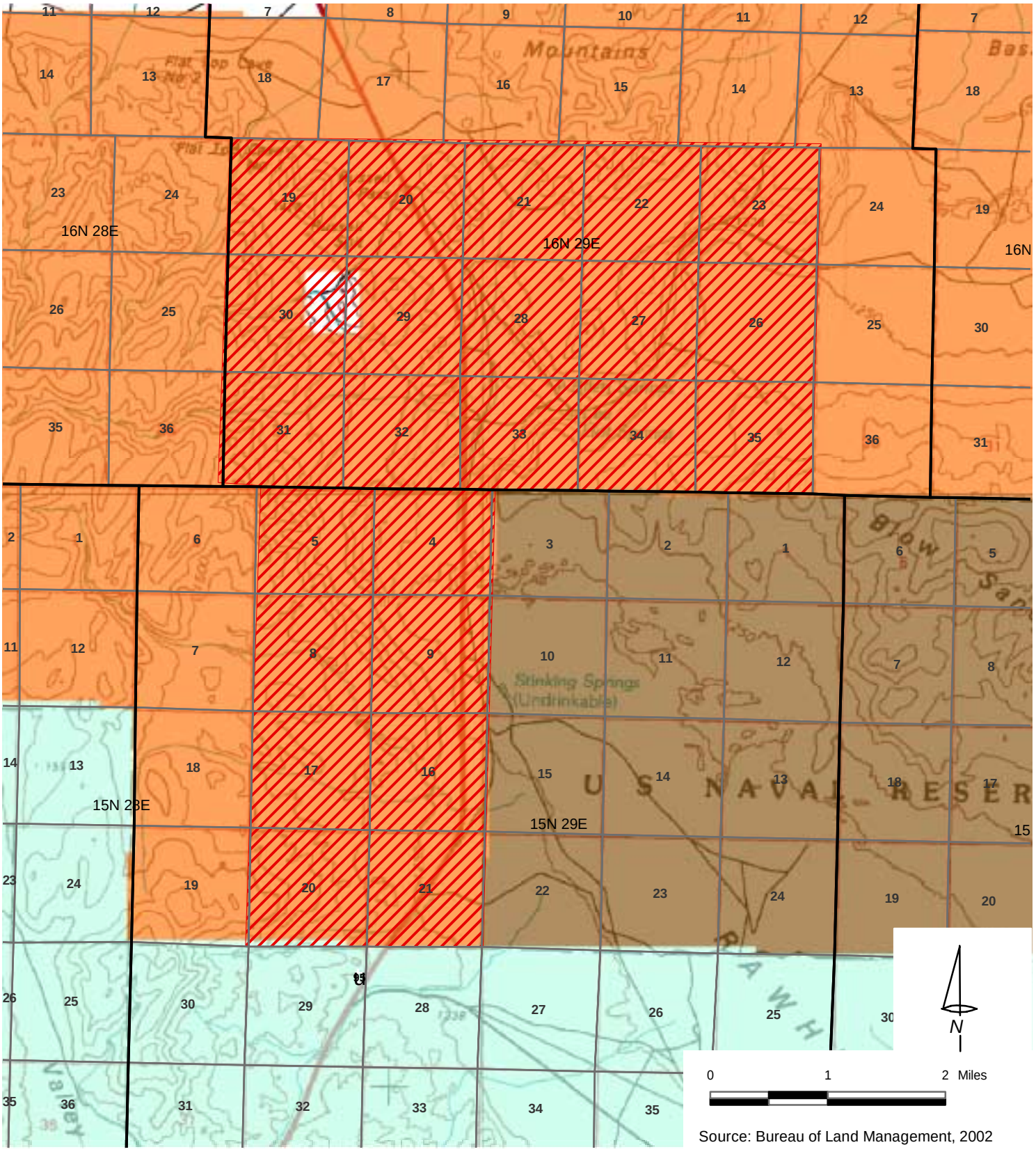
- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Private Lands
- Water

Salt Wells KGRA and Noncompetitive Lease Area

Carson City Field Office, Nevada

Figure 2-5

Tetra Tech, Inc



Source: Bureau of Land Management, 2002

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Legend

Noncompetitive Lease Applications

Land Ownership

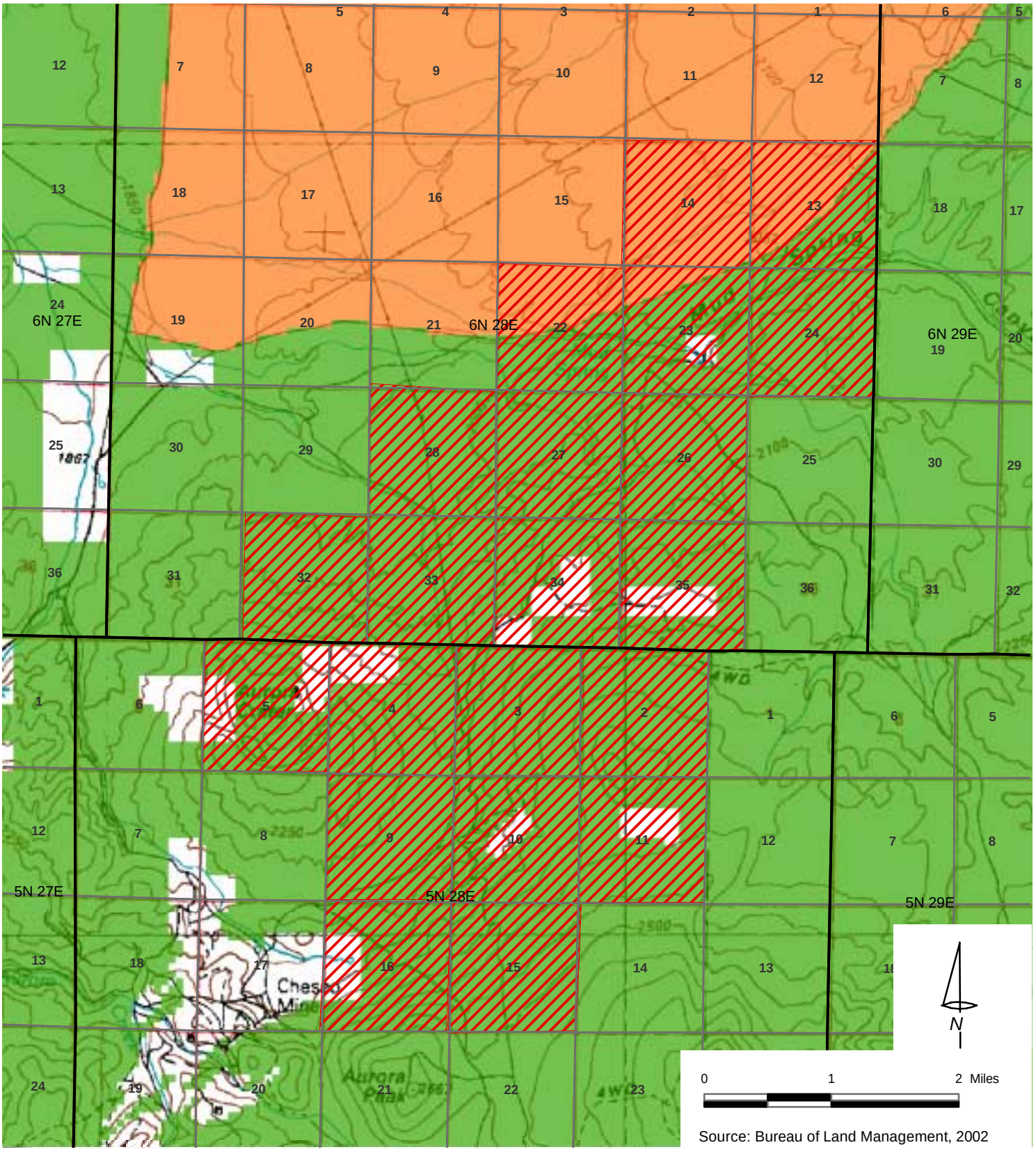
- Bureau of Land Management
- Department of Defense
- Native American Reservation
- Private

Lee Hot Springs Noncompetitive Lease Area

Carson City Field Office, Nevada

Figure 2-6

Tetra Tech, Inc



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Legend

Noncompetitive Lease Applications

Land Ownership

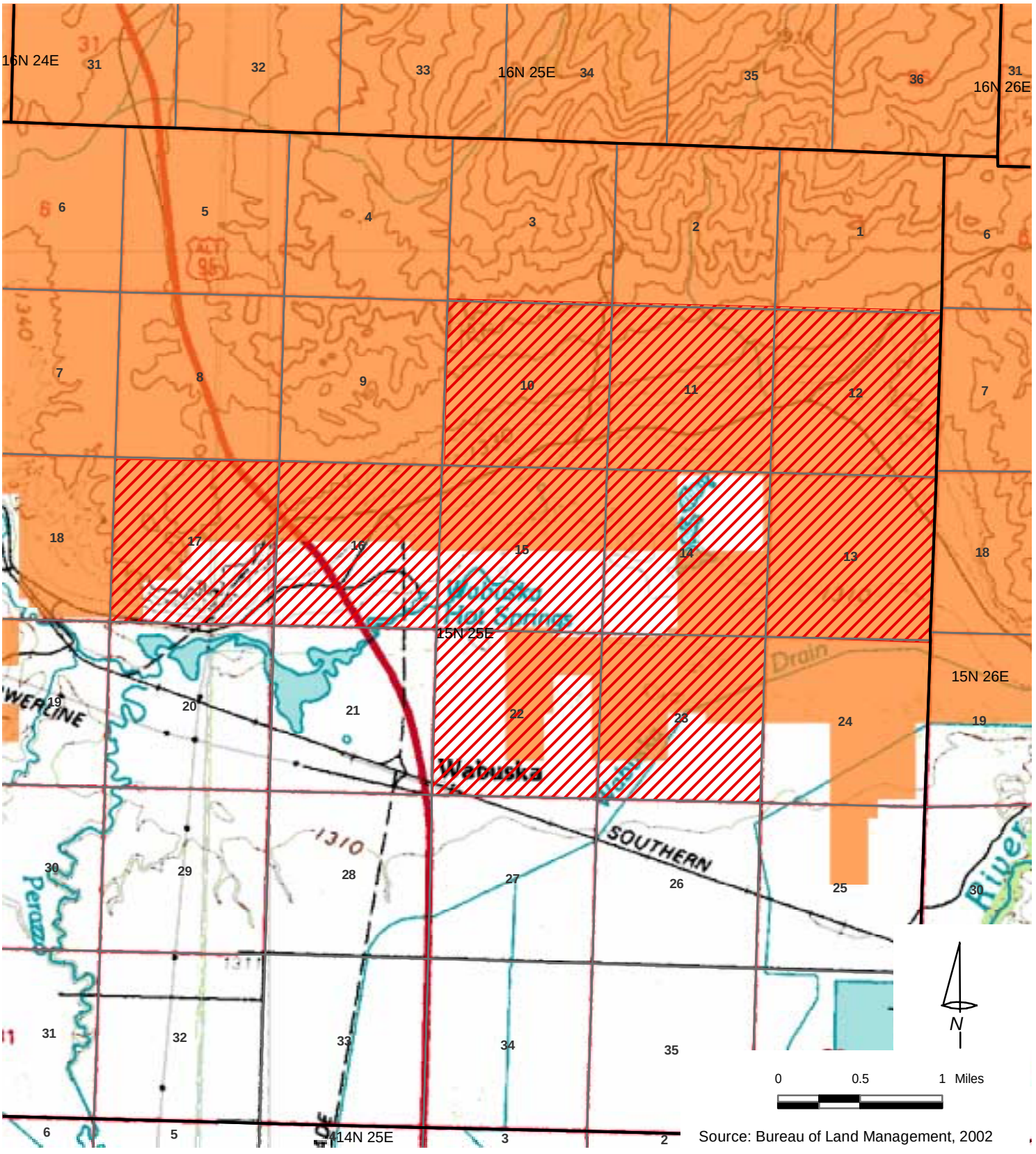
- Bureau of Land Management
- US Forest Service
- Private Lands

Aurora Crater Noncompetitive Lease Area

Carson City Field Office, Nevada

Figure 2-7

Tetra Tech, Inc



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Legend

Noncompetitive Lease Applications

Land Ownership

- Bureau of Land Management
- Private Lands
- Water

Wabuska Hot Springs Noncompetitive Lease Area

Carson City Field Office, Nevada

Figure 2-8

Tetra Tech, Inc

3. AFFECTED ENVIRONMENT

CHAPTER 3
AFFECTED ENVIRONMENT

Introduction

This section presents the existing environment for lands potentially affected by geothermal leasing in the eight lease areas identified: The Steamboat KGRA and noncompetitive lease area, the Hazen KGRA and noncompetitive lease area, the Soda Lake KGRA and noncompetitive lease area, the Stillwater KGRA, the Salt Wells KGRA and noncompetitive lease area, the Lee Hot Springs noncompetitive lease area, the Aurora Crater noncompetitive lease area, and the Wabuska noncompetitive lease area (Figure 1-1). Existing conditions for potentially affected resources are presented for the general lease areas and for specific lease areas, as appropriate.

Scoping and Issue Identification

In Accordance with FLPMA and NEPA, this document has been prepared with input from and coordination with interested agencies, organizations, and individuals within the region. During the scoping process for this EA, input was solicited from key agencies or groups with special expertise, interest, or administrative responsibility pertaining to the general geographical area, including the USFWS, the BIA, the Pyramid Lake Paiute, the Reno-Sparks Indian Colony, the Yomba Shoshone, the Fallon Paiute-Shoshone, the Walker River Paiute, the Washoe Tribe of Nevada and California, the Yerington Paiute, NDOW, the State Office of Historic Preservation, and Churchill, Washoe, Lyon, and Mineral counties.

BLM resource staff initially identified potential issues for analysis. Participants in the public scoping meetings also identified issues. The public was notified of the scoping process through a mailing to all interested parties (see Appendix E for the distribution list) and a BLM press release issued April 8, 2002. Letters from USFWS (Stillwater National Wildlife Refuge), NDOW, Nevada State Clearinghouse, and State Historic Preservation Office were received during the scoping period. The public was provided

with opportunity to comment on the scope of the EA at meetings held on April 24, 2002, in Fallon, Nevada, and on April 25, 2002, in Reno, Nevada. The public and agency participants raised additional issues at the public scoping meetings. All issues raised during scoping were considered in the development of this EA.

General Setting of the Proposed Action

A general description of the affected area is provided below. Detailed descriptions of the affected environment in the proposed lease areas can be found in the following documents, which are incorporated by reference into this EA:

- BLM Regional Environmental Analysis Record, Geothermal/Oil and Gas Leasing in the Pine Nut-Walker Area, 1974;
- BLM Regional Environmental Analysis Record, Geothermal/Oil and Gas Leasing in the Pyramid Area, 1974;
- BLM Regional Environmental Analysis Record, Geothermal/Oil and Gas Leasing in the Mina Area, 1974; and
- BLM Regional Environmental Analysis Record, Geothermal/Oil and Gas Leasing in the Fort-Churchill, Clan-Alpine Area, 1974.

The eight areas proposed for geothermal leasing are in western Nevada within the management area of the BLM Carson City Field Office. The majority of the proposed lease areas are in the Great Basin, in areas characterized by flat valley bottoms, playas, or low, rolling arid terrain. The predominant vegetation in these areas is greasewood and shadscale. Two of the lease areas, Steamboat and Aurora Crater, are along the eastern fringe of the Sierra Nevada Mountains and are characterized by more vegetation, including Jeffrey pine, pinyon, and juniper.

Resources either not Present or not Affected by the Proposed Action

The following resources are either not in the area potentially affected by the proposed action or are present but would not be affected by the proposed action:

- Farmlands—no prime or unique farmlands are within the proposed lease areas.
- Paleontology—no paleontological resources are known to occur in the proposed lease areas.
- Wild and scenic rivers—no rivers designated or considered for designation as wild and scenic rivers are within the proposed lease areas.

Resources Present and Brought Forward for Analysis

Based on recommendations of BLM resource specialists and issues raised during scoping, and the known occurrence of specific resources in the area, it has been determined that the following resources could be affected by the proposed action and are carried forward for analysis:

- Land use;
- Soils / geology / minerals;
- Water resources (including floodplains);
- Cultural resources / Native American consultation;
- Wildlife / fisheries / migratory birds;
- Threatened and endangered species (including areas of critical environmental concern [ACEC]);
- Vegetation / riparian habitat / noxious weeds;
- Visual resources;
- Socioeconomics;
- Recreation;
- Grazing resources;
- Wilderness Study Areas (WSAs);
- Air quality;
- Wild horses and burros; and
- Hazardous materials.

3.1 LAND USE

This section discusses the current land ownership and use within the region of influence (ROI) for each of the eight lease areas that are part of the proposed action. The ROI is the land area within and adjacent to potential lease parcels.

Leasing is proposed only on lands administered by BLM or on other lands where BLM has the express legal authority to lease with the concurrence of the other agency (USFS and Reclamation). On certain lands, the surface ownership is private or another non-federal entity, while the subsurface mineral ownership is retained by BLM. These areas are known as "split-estate" lands. BLM lands are administered for multiple use, including wilderness, recreation, livestock grazing/wild horse management, and mining, which may be incompatible with geothermal uses. Lands within the proposed lease areas may be subject to a variety of land use authorizations. These authorizations cover a wide variety of improvements, including telephone lines, roads, power transmission lines, grazing improvements, and water pipelines. Most authorizations are nonexclusive, and therefore compatible rights can be granted.

BLM is also directed by the 1983 State Legislature, through Senate Bill 40, to give consideration to appropriate state, local, and tribal lands in the development of land use plans for federally administered lands. BLM land use plans are reviewed for consistency with local policy plans for public lands and BLM land use plans are made compatible to the extent that the Secretary of the Interior finds consistent with federal law and the purpose of FLPMA.

The geothermal lease areas are located throughout west-central part of Nevada and include land in Churchill, Mineral, Washoe, and Lyon counties. The total lease area covers approximately 95,000 acres and includes land administered by BLM, USFS, and Reclamation. Lands within and adjacent to potential lease areas are owned or administered by a variety of entities, including BLM, USFS, Reclamation, USFWS, US Navy, the State of Nevada, local agencies, Native American groups, and private interests. Land ownership within each of the eight lease areas is shown in general on Figure 1-1 and in detail on figures 2-1 through 2-8.

USFS. The USFS manages the Toiyabe National Forest in Washoe, Lyon, and Mineral counties for multiple uses, including recreation, grazing, and mineral extraction. Dispersed recreation is the predominant sensitive use in this area. In accordance with the Steam Act, BLM administers geothermal leasing on USFS lands, with the concurrence of USFS.

Reclamation. Reclamation has withdrawn land west of the Salt Wells lease area and in the Stillwater and Soda Lake lease areas as part of the Newlands Project, which provides water for domestic, irrigation, and other uses. No sensitive land uses are associated with the Newlands Project.

USFWS. The Stillwater National Wildlife Refuge (NWR), Fallon NWR, and Stillwater WMA are managed by the USFWS and are within and adjacent to the Stillwater and

Soda Lake lease areas. BLM cannot authorize leases within NWRs or WMAs, in accordance with the Steam Act, 43 CFR Part 3200 *et seq*. Biological resources found in these areas are discussed in Section 3.3. The USFWS is proposing to modify and extend the boundaries of the Stillwater NWR.

There are few population centers within the ROI. Reno is approximately 12 miles north of the Steamboat KGRA, while Carson City is approximately 17 miles south of the Steamboat KGRA. Fallon is two miles south of the Soda Lake KGRA, three miles west of the Stillwater KGRA, and three miles northwest of the Salt Wells KGRA and noncompetitive lease area. The city of Hawthorne is approximately four miles northeast of the Aurora Crater noncompetitive lease area. Other population centers include Fernley and Yerington in Lyon County, and Hazen in Churchill County.

As discussed in Section 3.10 Wilderness Study Areas the Stillwater Range WSA and Job Peak WSA are not within but are in the vicinity of the Stillwater lease area. WSAs are managed to preserve the wilderness characteristics, regardless of suitable or unsuitable recommendations by BLM field offices. Management objectives for wilderness emphasize managing areas recommended for wilderness designation as wilderness in the long run. Neither the Stillwater WSA nor the Job Peak WSA are recommended as suitable for wilderness designation. The former Burbank WSA near the Wabuska lease areas has been designated as a scenic area. Also, the Steamboat KGRA is in the vicinity of the Mount Rose Wilderness Area.

Steamboat KGRA and Noncompetitive Lease Area

As discussed in Section 1, geothermal leasing by BLM in the Steamboat area was modified by approval of the Southern Washoe County Urban Interface Plan Amendment (BLM 2001a). The plan amendment established that no future geothermal leasing would occur on public lands, except within or adjacent to the established Steamboat KGRA. Lands proposed for leasing within or adjacent to the Steamboat KGRA are managed by BLM or USFS; however, three land sections proposed for leasing in the Steamboat area are split-estate lands: section 34 T18N R20E, section 6 T17N R20E, and section 36 T18N R19E. While BLM retains the right to develop leasable minerals on these lands, including geothermal resources, development would have to be accomplished without being substantially incompatible with surface land uses.

Land in and around the Steamboat KGRA is the most urban of all the lease areas considered in this EA. Although Reno is approximately 12 miles north of the Steamboat KGRA, subdivisions of the greater Reno area extend south to the Steamboat KGRA. Of the areas proposed for leasing, section 34 T18N R20E is the most developed with many residential areas located throughout the section. The Washoe Plan Amendment designated approximately 291 acres of public land within section 34 T18N R20E for disposal.

Other sections proposed for leasing also include residential development or other development, including the Fawn Lane residential area along the western edge of

section 36 T18N R19E, the Steamboat Hills residential area in section 6 T17N R20E, the Pagni Lane residential area in section 12 T17N R19E, and the Laramie Drive residential area in section 8 T17N R20E.

Surrounding lands are private or administered by BLM, USFS, or the State of Nevada (Figure 2-1). Land uses in the area range from low- to high-density residential developments, commercial uses, and educational facilities, particularly east of Highway 395 and north of Mt Rose Highway, to undeveloped, open space and agricultural. Several residential areas are immediately adjacent to land sections proposed for leasing, including residential development in Pleasant Valley east of section 12 T17N R19E, west of section 8 T17N R20E, and south of section 6 T17N R20E, the Rolling Hills residential area east of section 36 T18N R19E and north of section 6 T17N R20E, residential development north of section 34 T18N R20E, as well as dispersed residential uses throughout the area.

Four binary geothermal power facilities are currently operating in the Steamboat area, capable of producing approximately 35 megawatts (MW) of power. Another 14.4 MW single flash geothermal power facility operated by Caithness Sequais is further to the west. As discussed further in Section 3.5, Biological Resources, an ACEC designated for the preservation of the endangered Steamboat Buckwheat is west of section 34 T18N R20E.

The Washoe County Comprehensive Plan, including the relevant area and specific plans for the Steamboat area, guides development on private lands surrounding proposed lease areas (Washoe County 1994). Planned land use for the proposed lease sections are medium density suburban and open space (T18N R20E section 34), and rural/rural residential and medium density rural (T17N R20E sections 6, 8, and 12). Further residential developments are planned for section 34 T18N R20E (Whitney 2002). In addition, the proposed I-580 federal highway would be constructed across a portion of section 12 of T17N R20E (Whitney 2002). Energy production is considered a permitted use in open space and public areas under special use permit. The Comprehensive Plan specifically recognizes and encourages further use and development of geothermal resources in this area (Washoe County 1994).

Hazen KGRA and Noncompetitive Lease Area

Lands proposed for leasing in and around the Hazen KGRA are administered by BLM for multiple use, or are Reclamation lands withdrawn as part of the Newlands water project. The State of Nevada administers certain lands within the KGRA that are withdrawn by Reclamation, as part of the Fernley State Wildlife Management Area. The federal government retained the right to geothermal leasing on these lands.

Surrounding lands are private or administered by the State of Nevada (Figure 2-2) and are generally undeveloped open space and agriculture. The town of Fernley is approximately five miles west of the KGRA. The Fernley WMA, managed by the NDOW, is both within and north of the Hazen KGRA. The Pyramid Lake Indian Reservation is approximately six miles northwest of the Hazen lease area. The Churchill

County Master Plan, which guides development on non-federal lands in the area, identifies the area as open lands (Churchill County 1990). Primary uses for open lands would include outdoor recreation, agriculture, or for environmentally sensitive areas, such as wetlands.

Soda Lake KGRA and Noncompetitive Lease Area

Lands proposed for leasing in and around the Soda Lake KGRA are administered by BLM for multiple use, or are Reclamation lands withdrawn as part of the Newlands water project.

Surrounding lands are private or are administered by Reclamation (Figure 2-3). Fallon is approximately five miles south of the KGRA boundary. The Stillwater WMA is immediately east of the KGRA. Similar to the Hazen KGRA, the area generally consists of undeveloped lands that are private or are administered by Reclamation. These lands are identified as open in the Churchill County Master Plan (County of Churchill 1990). Primary uses for surrounding open lands include outdoor recreation, agriculture, or for environmentally sensitive areas, such as wetlands.

Stillwater KGRA

Lands proposed for leasing in the Stillwater KGRA are administered by BLM for multiple use, or are Reclamation lands withdrawn as part of the Newlands water project.

Surrounding lands within and outside the KGRA are a mixture of private, Reclamation, State of Nevada, USFWS, or Fallon Indian Reservation lands (Figure 2-4). The city of Fallon is located approximately 8 miles west of the KGRA boundary. These lands are generally undeveloped and used for agriculture or wildlife habitat. Portions of the Stillwater NWR and the Stillwater Wildlife Management Area (WMA) are within and immediately adjacent to the Stillwater KGRA. The Fallon National Wildlife Refuge is located approximately 5 miles north of the KGRA. As described in Chapter 1, in accordance with the Geothermal Steam Act, BLM is prohibited from leasing tribal lands or lands within designated wildlife management areas. Consequently, no competitive or noncompetitive leasing is proposed within the Fallon Indian Reservation or the Stillwater NWR or WMA.

The Churchill County Master Plan identifies the Stillwater KGRA and surrounding area as public lands (Churchill County 1990). Primary uses for public land include large government facilities or, as secondary uses, large quasi-public facilities and utilities.

Salt Wells KGRA and Noncompetitive Lease Area

Lands proposed for leasing in and around the Salt Wells KGRA are administered by BLM for multiple use, or are Reclamation lands withdrawn as part of the Newlands water project. As discussed further in Section 3.8, Recreation, the Pony Express National Historic Trail crosses a number of land sections proposed for leasing (T17N R31E sections 31 and 32, T16N R31E Section 6, T16N R30E sections 1, 2, 3, 4, 9, and 10). Additionally, the Grimes Point Archaeological Area is north of US Highway 50,

within the proposed geothermal lease areas T18N R30E, sections 20, 28, and 29.Surrounding lands are mostly BLM, Reclamation, and US Navy, with a few small inholdings of private land (Figure 2-4). The city of Fallon is located approximately 6 miles northwest of the KGRA and NAS Fallon is immediately west of proposed noncompetitive lease areas.

Several areas where BLM is prohibited from leasing are within this lease area. The CCFO CRMP specifically prohibits geothermal leasing within the Grimes Point Archaeological Area, which comprises two halves of adjacent sections for which lease applications have been submitted (T18N R30E sections 20 and 29). The Carson Lake Pastures area is immediately west of the noncompetitive lease area. This area was approved for sale to the State of Nevada in the Settlement Act, Pub. L. 101-618, use as a wildlife management area. Although transfer of the property to the State has not been executed, Reclamation and the State of Nevada view this property as obligated under the Settlement Act and, therefore, geothermal leasing is not proposed. Portions of several sections proposed for leasing are part of the Carson Lake Pastures area (T17N R30E sections 5, 8, 17, 20, 29, and 32). Two sections proposed for leasing are on Navy withdrawn lands adjacent to NAS Fallon (sections 19 and 30 T18N R30E). Development of structures in excess of 50 feet on Navy withdrawn land is prohibited.

The Churchill County Master Plan identifies the Salt Wells KGRA and surrounding area as open, agricultural, and public land (Churchill County 1990). Primary uses for the surrounding open lands include outdoor recreation, agriculture, or for environmentally sensitive areas, such as wetlands, while public lands would include large government facilities or, as secondary uses, large quasi-public facilities and utilities.

Lee Hot Springs Noncompetitive Lease Area

Lands proposed for leasing in the Lee Hot Springs area are administered by BLM for multiple use.

Surrounding lands are mostly BLM, US Navy, and Walker Indian Reservation lands (Figure 2-5). The US Navy administers land immediately east of the proposed lease area as the B-19 training range. The Walker Indian Reservation is immediately south of the proposed lease area.

As discussed further in Section 3.8, Recreation, the Pony Express National Historic Trail passes north of the proposed lease area. Public lands surrounding the City of Fallon landfill were specifically identified for disposal for future expansion of the landfill in an amendment to the RMP (sections 20 and 21 T16N R29E). This land use may preclude future leasing. Several proposed lease sections are Navy withdrawn lands (sections 4, 9, 16 and 21 T15N R29E). Development of structures in excess of 50 feet is prohibited on withdrawn lands.

The Churchill County Master Plan identifies the Lee Hot Springs area as open or public lands (Churchill County 1990). Primary uses for surrounding open lands include outdoor recreation, agriculture, or for environmentally sensitive areas, such as wetlands,

while public lands would include large government facilities or, as secondary uses, large quasi-public facilities and utilities.

Aurora Crater Noncompetitive Lease Area

Lands proposed for leasing in the Lee Hot Springs area are administered by BLM or USFS for multiple use.

Grazing is the principle land use in this area, although small inholdings of private agricultural, mineral extraction, or open land are found within the federal lands proposed for leasing. The Chesco Gold mine is located partially within a tract proposed for leasing (T5N R28E section 16). Mineral County identifies land in the Aurora Crater area as open or agricultural (Mineral County 1990).

Wabuska Noncompetitive Lease Area

Lands proposed for leasing in the Wabuska area are administered by BLM for multiple use.

Surrounding lands are administered by BLM or are private. The Mason Valley WMA is located approximately 7 miles south of the lease area and the Walker Indian Reservation is located approximately 4 miles east of the lease area. A 1mW geothermal plant is in operation in the Wabuska area.

The Lyon County Master Plan identifies the Wabuska area as open or public lands (Lyon County 1990).

3.2 SOILS, GEOLOGY, AND MINERALS

This section provides an overview of regional and site-specific geology, soils, and mineral resources. The ROI is the land area within and adjacent to potential lease parcels. For reference, topographic features of the study area described in this section are illustrated on Figures 2-1 through 2-8, in the previous chapter.

Steamboat KGRA and Noncompetitive Lease Area

Physiography

The southern half of Washoe County, which contains the study area, is dominated by typical Basin and Range topography, with northeast-trending mountain ranges separated by alluvial basins. Relief varies, but valleys typically have elevations of between 4,000 and 6,000 feet, while the mountain ranges typically have elevations of between 6,000 and 8,000 feet (Bonham 1969). Relief in the Steamboat Springs area is about 6,400 feet (Thompson and White 1964). The KGRA is in a structural trough, bounded on the east by the north-trending Virginia Range and on the west by the Carson Range and Mount Rose. The center of the trough contains Steamboat Hills, a northeast-trending intensely faulted structure, tilted up along at least three systems of normal faults (Thompson and White 1964). Between Steamboat Hills and the Virginia Range are Pleasant Valley and Steamboat Valley, through which Steamboat Creek flows north to Truckee Meadows.

Geology

Most of the exposed rocks in Washoe County are Tertiary age or younger. Pre-Tertiary rocks occur in the southern portion of the county. Here, metamorphosed volcanic and sedimentary rocks of the late Paleozoic and middle Mesozoic are intruded by granitic rocks of late Mesozoic age (Bonham 1969). In the Steamboat Springs area, the basement rocks are deeply eroded and are overlain by thick Tertiary and Quaternary volcanic and sedimentary deposits. The oldest Tertiary volcanic deposits consist of rhyolite tuff, followed by Oligocene through Pliocene andesitic lavas and tuff-breccias of the Alta and Kate Peak formations. The volcanic deposits were overlain in places by freshwater sediments, including diatomaceous shale. These are in turn overlain by basalt lava flows and rhyolitic pumice deposits of the Pliocene-age Truckee Formation.

The area was uplifted, tilted more than 30 degrees, and deeply eroded during the late Tertiary. Volcanic eruptions of andesitic and basalt lava continued into the Pleistocene, with basalt and basalt andesite flows of the Lousetown Formation. The area was glaciated at least four times, leaving moraine deposits of glacial till (Thompson and White 1964).

The Steamboat Springs volcanic area includes six rhyolite domes. The western dome is about two miles south-southwest of Steamboat Hot Springs, a questionable dome underlies the hot springs, and four other domes are northeast of the springs. The southwest dome and one of the northeast domes are more than half a mile in diameter and nearly 500 feet in maximum relief (USGS 2002a).

The combination of shallow volcanism and abundant groundwater recharge created a hydrothermal system that circulated through the fractures in the rock, altering the rock and forming rich vein deposits, including gold and silver deposits of the Comstock Lode District. Virginia City, which was the center for development of the Comstock Lode, is in the Virginia Range southeast of the Steamboat Springs KGRA.

Seismicity

Many of the rangefront faults of the Steamboat Hills and the western margin of the Virginia Range have been active during Quaternary time and are considered to be currently active. Within a 20-mile radius of the project area there are more than 20 major Quaternary faults that may be capable of generating earthquakes of magnitude 6.6 or larger (dePolo et al. 1997). The nearest of these to the Steamboat Springs KGRA is the Eastern Reno Basin fault zone, which trends approximately north-south from the eastern margin of Steamboat Valley along the margin of Truckee Meadows to east of Sparks. The fault zone passes through Section 24 of the lease area. The nearest active fault on the west side of the project area is the Mount Rose fault zone, which trends north-south about two miles west of the KGRA. Both the Mount Rose fault zone and the Eastern Reno Basin fault zone are estimated to be capable of magnitude 7.1 and 7.0 earthquakes, respectively (dePolo et al 1997).

The US Geological Survey estimates that there is about a 95 percent chance of ground shaking, with a peak acceleration of greater than 50 to 80 percent of the acceleration of gravity, within the next 50 years in the project region, with the higher accelerations in the southern part of the region, near Washoe Lake (USGS 2002b). These estimates are for bedrock acceleration and do not account for amplification in unconsolidated sediments. Shaking intensity is likely to be stronger in areas underlain by unconsolidated sediments. Also, a shallow groundwater table can cause sandy sediments to liquefy during ground shaking. Liquefaction is a sudden loss of strength resulting from an increase in soil water pore pressure that causes sediments to become mushy.

Mineral Resources

The area has been intensely prospected because of its proximity to the Comstock Lode District to the east. The area yields a number of hydrothermal ore deposits, including lead, zinc, and silver (Union Lead Mine near the mouth of Galena Creek), gold (east side of Pleasant Valley, southeast of Little Washoe Lake, and near Steamboat Springs), silver (Steamboat Hills), and mercury (near Steamboat Springs and at the Wheeler Ranch on Evans Creek) (Thompson and White 1964). Hydrothermal mineralization is associated with faults and fractures, and with hydrothermal fluids containing iron and arsenic sulfides. Disseminated tungsten ore is found southeast of Little Washoe Lake where granitic rocks intrude limestone.

Soils

In Section 36, on the west side of the KGRA, and Section 34, on the east side of the KGRA, soils are shallow and consist predominantly of gravelly loams or rock outcrops. Soils in Section 12, adjacent to the southwest boundary of the KGRA, are also predominantly shallow rocky soils or rock outcrops. Low-lying, relatively level areas on

the floor of Pleasant Valley in the northwest quarter of Section 8 contain sandy or clayey loam soils, some of which are considered by NRCS (2002) to be prime farmland. These units include Settlemeyer fine sandy loam, Aladshi sandy loam, and Idlewild clay loam.

Hazen KGRA and Noncompetitive Lease Area

Physiography

The Hazen area straddles the border between Lyon County and Churchill County, to the south and west is the Virginia Range, and to the northwest is the Truckee Range. The eastern half of the area overlies the southern part of the Hot Springs Range. The western half of the area is low-lying land, containing marshland and lakes that comprise the Fernley State Wildlife Management Area. The area lies on the southwestern margin of the Carson Desert, which is described below for the Stillwater area.

Geology

The Hot Springs Mountains are underlain mainly by Pliocene basalt, andesite, and sedimentary deposits. Cinnabar Hill, in the northeastern part of the range, contains rhyolite and quartz diorite intrusions and is in the Desert Mining District, a gold and silver producing area. The Hot Springs Mountains are dominated by many high-angle northeast-trending faults that parallel the Midas Trough fault system, one of the three major fault systems that intersect in the Carson Desert (Maurer et al. 1994). The Midas Trough system is a zone of left-lateral faults that extends from near Carson City, through Idaho and into Montana and has been active for about 15 million years. The Dead Camel Mountains, south of the Hazen area, contain a broad exposure of Tertiary sedimentary pyroclastic (volcanic ash) deposits, intruded by Pliocene basalt flows. The Truckee Range is almost entirely composed of Pliocene basalt and is traversed by northeast-trending faults, similar to the Hot Springs Mountains.

Seismicity

The Hazen area is a seismically active area, cut by many young faults. Seismic potential of the region is similar to that described below for the Soda Lake KGRA.

Mineral Resources

The west side of the Hot Springs Mountains is in the Leete Mining District, an area of salt and minor borax production. Metallic mineral deposits are apparently confined to the northern Hot Springs Mountains, in the vicinity of Bradys Hot Springs, where hydrothermal mineral deposits, including mercury (cinnabar), silver, and gold, have been produced.

Soils

The eastern half of the area is dominated by soils of the Bango-Stumble association. These soils border uplands and are on high lake terraces that are encroached on by alluvial fans and windblown sands (SCS 1975). Bango soils are on smooth lake terraces and have a sandy loam surface layer, underlain by cobbley or gravelly sandy loam and by strongly alkaline sandy and silty loam. Stumble soils are formed on alluvial fans that

have encroached on Bango soils. The soils can produce alfalfa, pasture, and grains, if irrigated, but they are not classified as prime farmland.

The western side of the Hazen area is dominated by Parran soils, lying between the marshy wet areas in the north and "badlands" soils to the south. Parran soils are very deep, nearly level, and somewhat poorly drained soils that formed in clayey alluvium. They occur on low lake terraces and in basins. The soils are used for limited grazing. Badlands are large bands of moderately steep shorelines of ancient Lake Lahontan. The soils are severely eroded and highly alkaline and generally barren of vegetation.

Soda Lake KGRA and Noncompetitive Lease Area

Physiography

The Soda Lake lease area is in the Carson Desert, a large structural and topographic depression that drains internally toward the Carson Sink to the north. The Carson Desert is in a fault-bounded basin between northeast-trending ranges. To the northwest are the Hot Springs Mountains, and to the southeast is the Stillwater Range. Both ranges contain outcrops of basalt and andesitic lava flows (Stewart and Carlson 1978).

Geology

The study area is northeast of Soda Lake, a saline lake formed in a Quaternary maar crater (an explosive, low-relief volcano that forms in an area of shallow groundwater and often fills with water to form a lake). In the northeastern corner of the KGRA is another outcrop of Quaternary basalt called "The Hogback," which probably formed under similar conditions to the maar of Soda Lake. The surficial deposits in the study area consist of eolian sands overlying and interbedded with Quaternary lake and delta sediments associated with Lake Lahontan, an immense Pleistocene lake. Below the lakebed deposits are more than 3,000 feet of unconsolidated and semiconsolidated Quaternary and late Tertiary sediments, eroded from the surrounding ranges and interbedded with basalt flows (Chevron 1987). The basin fill is in turn underlain by consolidated rocks of Tertiary to Mesozoic age.

Seismicity

The area is seismically active. The most recent large earthquakes occurred in 1954, with magnitudes of 6.8 to 7.1. The epicenters were in the Lahontan Mountains and in the Stillwater Range. Surface displacements were observed within a zone about 60 miles long and 20 miles wide, with maximum vertical displacement of up to 20 feet (Oakeshott 1973). The earthquakes reportedly caused benchmarks in the basin to drop by as much as seven feet, indicating that the extensional tectonics that formed the basins is continuing. The US Geological Survey estimates that there is about a 95 percent chance of ground shaking, with a peak acceleration of greater than 25 to 30 percent of the acceleration of gravity, within the next 50 years in the project region, with higher accelerations nearer the ranges (USGS 2002b). These estimates are for bedrock acceleration and do not account for amplification in unconsolidated sediments. Shaking intensity is likely to be much stronger in areas underlain by unconsolidated sediments. Also, a shallow groundwater table can cause sandy sediments to liquefy

during ground shaking. Liquefaction is a sudden loss of strength resulting from an increase in soil water pore pressure that causes sediments to become mushy.

Mineral Resources

The Soda Lake region contains abundant metallic and nonmetallic mineral deposits. The area has been an important producer of iron, silver, and gold and may still contain undeveloped silver and gold deposits. Significant nonmetallic mineral resources found in the area include sand and gravel, diatomite, pumice and perlite, salt, stone, limestone, fluorspar, and gemstones.

Soils

Most of the soils in the KGRA belong to the Tipperary-Appian association (SCS 1975). Soils in the northern portion of the KGRA, surrounding the Upsal Hogback, belong to the Hooten-Huxley-Labou association. Soils in the eastern portion of the KGRA, in the Carson River drainage, belong to the Dia-Sagouspe-East Fork association.

Appian soils are very deep well-drained soils that form in loamy alluvium underlain by lake sand deposits. Permeability is moderately slow at the surface but rapid below the surface, except where clay is present. Tipperary soils consist of very deep excessively drained soils that form in sandy alluvium and eolian sands. Permeability is very high. Both are highly susceptible to wind erosion when disturbed but occur on low slopes and gently-rolling or undulating surfaces. The association is about 38 percent Tipperary soils, 28 percent Appian soils, with the remainder consisting of Parran, Lahontan, Churchill, Soda Lake, Sagouspe, and Fernley soils and playas (SCS 1975). Soda Lake soils, which occur in Section 5 northeast of Soda Lake, are considered prime farmland if irrigated and reclaimed of excess salts and sodium (NRCS 2002).

The Hooten-Huxley-Labou soils are moderately well drained, coarse to fine textured, and formed on recent lake terraces and volcanic cones. Hooten soils are thin, with a silica-cemented hardpan about five inches thick, just below the subsoil layer. Huxley soils are very deep and moderately well drained. They formed in lakebed deposits and have a surface layer of gravelly clay loam. Labou soils are shallow and well drained. They occur on uplands truncated by water and have a surface layer of gravelly sandy clay loam, underlain by hard rocky tufa. The association consists of about 25 percent Hooten soils, 22 percent Huxley soils, 22 percent Labou soils, and 18 percent Gardella soils. The remainder consists of Tipperary, Parran, and Bango soils and areas of Rock outcrop (SCS 1975).

Dia-Sagouspe-East Fork soils are poorly drained, fine to moderately fine textured, and are found on floodplains and low stream terraces in the central farming area surrounding the city of Fallon. Dia soils are very deep, silty clay loam. Sagouspe soils are very deep and are found on smooth stream terraces. They are dominantly loamy sand, with thin sandy to silty clay strata. Both soils are considered prime farmland if irrigated. The association is about 29 percent Dia soils, 13 percent Sagouspe soils, 9 percent East Fork soils, and 9 percent Fernley soils. The remainder consist of Caracity, Dithrod, Bunejug, Erber, Fallon, Pelic, Ragtown, Swope, and Swingler soils (SCS 1975).

Stillwater KGRA

Physiography

The area is in the western part of the Basin and Range physiographic province. The Carson Desert is the largest intermontane basin in northern Nevada, about 70 miles long and ranging 8 to 30 miles wide. The Stillwater KGRA ranges in elevation from about 3,870 feet in the wetlands areas to about 5,450 feet in the Lahontan Mountains. The area lies within a shallow structural trough that trends to the northeast and slopes gently toward Carson Sink, a nearly flat salt-encrusted playa about 20 miles wide. Lakes and wetlands cover about half of the study area. Irrigated farmlands are mainly confined to the central portion of the trough, around the community of Stillwater. The southeastern portion of the study area is primarily densely to sparsely vegetated rangeland. The northeastern portion is mainly wetlands, and the northwestern area is a mixture of wetlands and rangeland (Morgan 1982).

Geology

The Carson Desert is underlain by Quaternary sand dunes and stream sediments, interbedded lake deposits of Pleistocene Lake Lahontan, and volcanic rocks that are about 1,000 feet thick. These form the principal shallow groundwater system. The basin fill deposits are in turn underlain by Tertiary and older igneous and sedimentary rocks. The Stillwater Range contains early to middle Mesozoic sedimentary rocks intruded by middle to late Mesozoic igneous rocks. The igneous intrusions resulted in volcanic eruptions during the Tertiary, creating andesitic lava flows that were in turn covered by welded and nonwelded tuffs, which were followed by basalt flows. The major uplift and block faulting that formed the ranges occurred during the late Tertiary and continued until as recently as about one million years ago (Morgan 1982).

Lake Lahontan, which covered a large portion of Churchill and Mineral counties, rose and receded in a number of episodes in response to glacial cycles. Basins alternately filled with water and then dried out, causing lakes to merge and separate, and leaving evidence of the lake levels in erosional terraces on the margins of the basins. During wet periods deposits tended to be dominated by silts and clays, but during dry periods sand dunes and coarser alluvium would dominate. Throughout the period, volcanic eruptions continued, some of the volcanic material being deposited in the water and some when the water had receded. Thus, a wide range of sedimentary deposits are complexly interbedded in the basin.

Two sets of Tertiary or younger faults are seen in the basin, the oldest trending generally northwest, which occurred during the Miocene, and a younger north to northeast-trending set, which probably occurred since the late Pliocene and which is still active. The most recent major episode of faulting occurred in the late Pleistocene. The intersections of the older and younger faults are thought to be zones of high fracture permeability that may be conducive to formation of a geothermal reservoir (Morgan 1982).

Seismicity

The area is seismically active, as described above for the Soda Lake KGRA.

Mineral Resources

Because most of the study area is underlain by basin fill consisting of sandy or clayey deposits, there are few significant mineral resources within the study area.

Soils

The northeastern area is dominated by marsh and soils of the Carson-Stillwater complex. The soils are found on smooth flat floodplains and deltas, surrounded by open bodies of water and marsh. The soil is predominantly clay or clay loam and is strongly saline-alkali affected. Groundwater is shallow, at a depth of 1.5 to 3 feet, and vegetation is sparse and consists of salt-tolerant species.

Soils in the north and northwestern area include Carson-Stillwater complex soils, as in the northeast but generally more sandy. For example, Appian soils, which cover about one-third of the area, are very deep, well drained, and formed in loamy alluvium over sandy lake sediments. They occur on nearly flat, low-lying, smooth terraces. Typically, the surface is sandy loam, underlain by friable clay loam. Below this is sandy loam and sand to a depth of five feet. Permeability is moderately slow in the surface but very fast in the subsurface. Soils of the Tipperary-Parran complex formed on stabilized dunes, adjacent to the Appian soils, and consist of fine sands and silty clays. The water table is three to five feet below the surface.

In the southeastern area south of the town of Stillwater, the soils are predominantly Carson clay soils, bordered on the south by playas south of Stillwater Point Reservoir, and on the west by fine dune sand soils of the Tipperary series. The Carson soils are slightly to strongly saline, with a shallow water table. The Carson clay soils can become prime farmland if irrigated to remove excess salts and sodium.

Salt Wells KGRA and Noncompetitive Lease Area

Physiography

The Salt Wells study area is south of Fallon Naval Air Station, including the north part of the Salt Wells Basin, the southwest flank of the Lahontan Mountains, the north end of the Bunejug Mountains, and the eastern third of Carson Lake.

Geology

Northwest-trending faults in the Salt Wells Basin parallel to the Walker Lane fault system and in the area west of the Bunejug Mountains. The Bunejug Mountains are primarily composed of Pliocene basalt, as are the Lahontan Mountains to the north. Both the Salt Wells Basin and Carson Lake and the surrounding margins are underlain by playa lakebeds.

Seismicity

The US Geological Survey estimates that there is about a 95 percent chance that peak bedrock acceleration in an earthquake would exceed 30 to 40 percent of the acceleration of gravity within the next 50 years in the project region (USGS 2002b). This is a moderately high bedrock acceleration. Ground shaking could be more intense in areas underlain by unconsolidated basin fill materials. The area is in Seismic Zone 4 (the highest zone rating) of the Uniform Building Code.

Mineral Resources

Most of the study area is underlain by basin fill deposits. No significant metallic ore deposits have been identified, and the area does not contain any important nonmetallic mineral deposits, such as sand, gravel, and salt.

Soils

The soil cover in the central highlands of the Bunejug Mountains belongs to the Pirouette-Osobb association, which consists of nearly level to moderately steep soils in large areas of rolling uplands. The soils are generally shallow (about 20 inches), well drained, stony sandy loam to cobbley clay loam, derived from tuffs and basalts and including areas of rock outcrop. Average annual precipitation is about five to seven inches. The soils are used for grazing and wildlife habitat.

Lower on the margins of the Bunejug Mountains are soils belonging to the Biddleman association. These soils occur in broad bands bordering uplands on high shoreline terraces. The soils are about 60 percent Biddleman gravelly sandy loam. Runoff is slow and the hazard of erosion is slight. The soils are used for limited grazing and wildlife habitat.

Portions of the southern part of the area, in the vicinity of Simpson Pass are covered with Tipperary soils, which are fine windblown sands. Tipperary-Parran soils, for example, developed on stabilized dunes and consist of fine sands and silty sands. These soils are used for grazing and wildlife habitat. Tipperary soils occur on the margins of the Salt Wells Basin playa. Playa soils occur on nearly level basin floors and consist of clayey material that ranges from sand to clay and are strongly alkaline. Drainage is poor and water tends to pond on the soils. They are generally barren of vegetation (SCS 1975).

On the west side of the Bunejug Mountains are marshlands of Carson Lake bordered by Lahontan clay soils. These are slightly saline to strongly saline soils that border lake basins. The Lahontan soils are poorly drained and difficult to reclaim for agricultural use because of their slow permeability. The soils are deep and consist of plastic clay.

Bordering the Lahontan clay soils are Badlands, which are strongly alkaline lakebed deposits that form steep shorelines of ancient Lake Lahontan. They are generally barren of vegetation.

The northwestern corner of the study area contains a complex mix of soils that are generally clayey and saline and border marshy areas of Carson Lake. The northern part of the area, at the north end of the Salt Wells Basin, and west of Highway 50, contains Tipperary fine sand, described above. Few of these soils are suitable for farmland. The clay soils can be farmed if reclaimed of excess salts and sodium, but this is a lengthy process due to their slow permeability.

Lee Hot Springs Noncompetitive Lease Area

Physiography

The study area is in southwestern Churchill County, just south of the Carson Desert, in the Basin and Range physiographic province. The western margin of the study area is on the east flank of the Desert Mountains, the northeast margin of the study area is bounded by White Throne Mountain, and the central and southeastern portion of the study area overlies the northern margin of Rawhide Flats. This is a closed saline basin, containing a playa lake, and includes the northwestern limb of the Blow Sand Mountains.

Geology

The Desert Mountains are an east-trending range. The oldest rocks exposed in the range are Miocene rhyolites, overlain by dacite flows, which are in turn overlain by basalt and andesite as young as Pliocene age (Willden and Speed 1974; Stewart and Carlson 1978). White Throne Mountain is a low mainly volcanic hill south of Carson Lake. The mountain has been mapped as mostly basalt of the Bunejug Formation (north of the study area) overlying Eagles House Rhyolite (within the study area), of late Tertiary age (6 to 17 million years old) (Stewart and Carlson 1978). The Blow Sand Mountains are a low range of mostly volcanic rocks. The rocks exposed in the study area are Pliocene age basalt, but the range is underlain by pre-Tertiary marble, granodiorite, and quartz diorite (Willden and Speed 1974).

Seismicity

The US Geological Survey estimates that there is about a 95 percent chance that peak bedrock acceleration in an earthquake would exceed 30 to 40 percent of the acceleration of gravity within the next 50 years in the project region (USGS 2002b). This is a moderately high bedrock acceleration. Ground shaking could be more intense in areas underlain by unconsolidated basin fill materials. The area is in Seismic Zone 4 (the highest zone rating) of the Uniform Building Code.

Mineral Resources

Mineral deposits in the Desert Mountains include Pliocene diatomite and a large perlitic flow near the top of the rhyolite sequence. The diatomite has been mined to some extent, but the perlite has not been developed (Willden and Speed 1974). Perlite deposits are present in the White Throne Mountains, but most of the deposits are reportedly buried beneath thick volcanic flows. Most mining has been done outside the study area. The nearest large-scale mining is in the Holy Cross Mining District, south of the study area.

Soils

The land west of Highway 95 in the study area is generally upland sloping and rocky, while east of Highway 95 it is on the basin floor. The soils reflect these differences. West of Highway 95 the soils tend to be rocky, while east of Highway 95 they are finer and contain a higher percentage of clays. At the south end of the study area the soil belongs predominantly to the Isolde-Pirouette-Hawsley association. These soils are found on slopes of up to 30 percent, in areas with precipitation of about six inches per year. Most of the soils are sandy. Isolde soils are formed on stabilized dunes, and Hawsley soils are formed on wind-deposited sand sheets. Pirouette soils are stony, very fine sandy loam, formed in residuum and colluvium derived from volcanic (basalt) rocks. The soils are well drained, moderately to highly permeable, and slightly to strongly alkaline. They are used mainly for wildlife habitat and grazing. Adjacent to and east of Highway 95, in the southern part of the study area, are soils of the Isolde-Parran-Appian association (north) and of the Hawsley-Isolde association (south). As described above, the Isolde and Hawsley soils are both formed on loose wind-deposited sands and are permeable and well drained. The Parran and Appian soils are also formed from fine sandy parent material. Parran soils are formed on stabilized dunes. Appian soils are very deep, well drained, and formed in loamy alluvium over sandy lake sediments. Typically, the surface is sandy loam, underlain by friable clay loam. The Isolde-Parran-Appian soils cover the margins of Rawhide Flats.

In the northwestern part of the study area are soils of the Old Camp-Mirkwood-Nemico association in upland areas to the west, with Pirouette-Osobb-Rock Outcrop association in the center, and Biddleman association soils on the east, nearest the highway. There is also a small band of Singatse-Rock Outcrop association soils in the northwest corner, bounded on the north and south by Buckaroo-Bluewing association soils. The Old Camp-Mirkwood-Nemico soils are shallow (12 to 16 inches), well drained, and formed on colluvium derived from volcanic rocks, on a range of slopes from shallow to very steep. The clay content ranges from about 25 to 45 percent. The Old Camp soils are more gravelly, and the Nemico soils tend to be more clayey. These soils are primarily used for wildlife habitat and rangeland.

Pirouette-Osobb soils are shallow to very shallow soils that formed in colluvium derived from volcanic rocks. Pirouette soils overlie basalt, and Osobb soils overlie rhyolite tuff, at depths of about 18 to 20 inches. They are well drained and have medium to high runoff and moderate permeability. Biddleman soils are very deep well-drained soils that formed on alluvium derived from coarse beach terrace sediments deposited over saline lake sediments. They consist of stratified sand and gravel, containing about 70 to 80 percent rounded pebbles at depths of from about eight inches to five feet.

Singatse soils are very shallow gravelly loams that form in colluvium derived from volcanic rocks. Depth to andesite bedrock is about 4 to 10 inches. The Buckaroo-Bluewing soils are very deep well-drained soils that formed in alluvium derived from mixed volcanic rocks. Bluewing soils are sandier, and Buckaroo soils are finer and clayier. Both soils contain increasing amounts of pebbles with depth.

East of Highway 95 in the northern portion of the study area Hawsley-Appian-Ruhe association predominates on the valley floor, with scattered islands of Singatse-Rock Outcrop association. The Hawsley soils are sandy and formed on sand sheets. Appian soils are fine and sandy. The Ruhe series consists of shallow well drained soils that formed in wind-deposited sand and alluvium derived from mixed rocks. Ruhe soils are on lake terraces and beach terraces with slopes of 0 to 15 percent.

Aurora Crater Noncompetitive Lease Area

Physiography

The study area is in Mineral County and includes Aurora Crater, which is about 7,500 feet in elevation. To the southwest are Aurora Peak and Mount Hicks. Both are under 9,800 feet in elevation. Mud Spring is in the northern part of the study area, northeast of the crater, along Mud Spring Creek, which issues from Mud Spring Canyon east of the study area. Drainage is generally toward the northwest, toward the East Walker River. The Aurora Crater area lies within the Walker Lane, one of the three major fault systems in west-central Nevada. The Walker Lane is a system of northwest-trending right-lateral strike-slip faults that is about 80 to 120 miles wide and extends about 400 miles along the California border from near Las Vegas to northwest of Reno (Maurer et al. 1994). The fault system has been active for the past 15 million years.

Geology

The Aurora Crater geothermal area is in the Aurora-Bodie volcanic field, situated between the Sierra Nevada and the Great Basin. The area is underlain by approximately 25 square miles of andesitic lavas, breccias, and ashflow tuffs, which erupted 8 to 15 million years ago (USGS 2002b). Andesite domes and flows 4.5 to 2 million years in age occur at Cedar Hill, to the south of the Aurora Crater, and in other areas in the field. Pleistocene and younger (less than 10,000 years old) to late Holocene basaltic rocks form well-preserved cinder cones and flows cover approximately 30 square miles. The Mud Springs volcano, which is probably Pleistocene in age, consists of a steep-fronted bulbous flow surrounding a depressed vent area, and a four-mile-long ridged flow, together creating a remarkably distinctive landform.

Aurora Crater is approximately seven miles west of Mud Springs volcano. It is a mile-wide breached crater that erupted approximately 250,000 years ago. The topography of the entire area has been covered by ash, probably erupted from the younger Mono Craters to the southwest. Gold and silver found in quartz veins in the Miocene (but not younger) volcanic rocks were mined until about 1950, with mining centers at Bodie, California, and Aurora, Nevada.

The Aurora Crater area is approximately 30 miles northeast of the Long Valley Caldera and the Mono-Inyo Craters Chain, south of Mono Lake, California.

Seismicity

The region of Aurora Crater is seismically active. It is northeast of the Long Valley Caldera, in California, part of a chain of volcanic centers near the California-Nevada border that includes Inyo Craters and Mono Craters.

The USGS estimates that there is a five percent chance that within the next 50 years an earthquake capable of producing ground accelerations of 40 to 60 percent of the acceleration of gravity will occur (USGS 2002b).

Based on the frequency of eruptions along the Mono-Inyo Crates volcanic chain in the past 5,000 years, the probability of an eruption occurring in the Long Valley Caldera in any given year is somewhat less than one percent per year, or roughly one chance in a few hundred in any given year. This is comparable to the annual chance of a magnitude 8.0 earthquake (like the 1906 San Francisco Earthquake) along the San Andreas Fault in coastal California or of an eruption from one of the more active Cascade Range volcanoes in the Pacific Northwest, such as Mount Rainier in Washington or Mount Shasta in California.

During a typical explosive eruption of a Mono-Inyo vent, tephra (volcanic ash and larger rock fragments) may accumulate near the vent to a thickness of over 30 feet. Areas downwind of an explosive eruption could be covered with a layer of volcanic ash and pumice more than eight inches thick at a distance of 22 miles and two inches thick at 53 miles.

Records suggest that on an annual basis winds in the area blow toward an east or northeasterly sector more than 50 percent of the time and toward some easterly direction more than 80 percent of the time. In general, the grain size and thickness of ash accumulations gradually decrease with increasing distance from a vent (USGS 2002c, 2002d).

Mineral Resources

The study area is in the old Aurora Mining District, later called the Esmeralda Mining District, after the Esmeralda gold vein. The town of Aurora, about two miles south of Aurora Crater, was the center of this mining activity and the largest town in Nevada in 1860. It is now a ghost town. There are many pits and adits south of the crater and several prospects elsewhere, adjacent to the crater. However, most of the significant epithermal gold deposits were shallow and easy to reach and were removed by the late 1800s. Recent gold and silver mines in the study area include the Borealis Mine, north of Mud Spring Canyon, and the Chesco Mine, between Aurora Crater and Aurora Peak. Reclamation activities were successfully completed at the Borealis Mine in 1990 to clean up waste piles used in the cyanide heap leach process.

Soils

The western portion of the study area includes the Aurora Crater. Soils on the crater are classified as Borealis-Rock Outcrop association. The Borealis soils are derived from volcanic ash and basalt and occur on slopes of up to 30 percent. The soils are

moderately deep and well drained and have very fast runoff and very slow permeability. The A horizon consists of ashy sand loam, but the B horizon, at about one foot depth, is clayey.

To the east of the crater the predominant soil is Borealis-Antholop-Rock Outcrop association. The Antholop soil is a shallow well-drained soil on moderate slopes, formed in weathered basalt rock. The A horizon is a sandy loam, but the B horizon quickly becomes clayey and is indurated with silica cement at depths of more than 16 inches. The subsoil is gravelly to cobbley and alkaline.

Soils in the extreme southern part of the study area are Nire Stony Fine Sandy Loam on 4 to 15 percent slopes. The Nire soils cover the south-facing slope of the crater.

Soils in the northern part of the study area, on the north slope of the crater sloping down to the basin floor at the head of Mud Spring Canyon, are distributed in east-west bands that roughly parallel Mud Spring Creek. South of the spring is a patch of soils belonging to the Loomer-Rowel-Wassit association. North of that is a broad swath of soils of the Antholop-Wedlar association. Just north of that is a longer band of soils belonging to the Wellsed-Mickey-Veet association. Farther north and away from Aurora Crater are soils of the Wellsed-Smedley-Mickey association. Small patches of other soils are also interspersed among these.

The Loomer-Rowel-Wassit soils are shallow (12 to 18 inches deep overlying bedrock) well-drained soils formed on weathered volcanic rocks, on slopes of 8 to 75 percent. Loomer and Rowel soils are extremely cobbley loams, with rapid runoff and slow permeability. Loomer soils contain more clay, and Rowel soils are sandier. Wassit soils are gravelly, rather than cobbley, sandy loam, and are less clayey than either the Loomer or Rowel soils.

Antholop soils are shallow and well drained and are formed on weathered basalt. They are found on plateaus with slopes of 2 to 15 percent. Alkalinity increases with depth, with increased cementation. At depths from about 16 to 60 inches the subsoil is silica cemented and contains about 60 percent cobbles and stones and 40 to 55 percent clay. Wedlar soils are very deep well-drained soils that form on weathered granitic rocks or welded tuff, on fans and inter-plateau basins. The clay content increases with depth to about three feet, ranging from loamy sand to loam, to sandy clay loam. The bottom three feet of the soil profile is massive, hard, gravelly sandy loam. Permeability of both soils is slow, and runoff is high.

Wellsed-Mickey-Veet soils are gravelly sandy loams that formed on predominantly granitic rocks with some volcanic rocks. Wellsed soils are moderately deep and formed on alluvial fans and piedmonts. Mickey soils are shallow, on slightly steeper slopes. Veet soils are very deep and formed on alluvial fans, piedmonts, and stream terraces. The Wellsed-Mickey-Vest soils are found in a band that generally follows the fall line of the slope below the mouth of Mud Spring Canyon.

The Wellsed-Smedley-Mickey soils are farther north of Aurora Crater and farther from the stream terrace deposits of Mud Spring Creek. In place of the deep Veet soil component, the association contains Smedley soils, which are shallow and overlie strongly cemented hardpan at 18 to 43 inches depth. Permeability is slow.

Wabuska Hot Springs Noncompetitive Lease Area

Physiography

The Wabuska Hot Springs area is west of the north-flowing East Walker River, northwest of Yerington, in Lyon County. The area is at the north end of the floor of Mason Valley, bounded on the north by the Desert Mountains, on the east by the Wassuk Range, and on the southwest by the Singatse Range.

Geology

The study area is almost entirely underlain by Quaternary alluvial basin fill deposits. The rocks exposed in the Desert Mountains to the north are primarily Pliocene basalts, cut by northeast-trending high-angle faults. The basalts overlie Tertiary andesite flows and related rocks and tuffaceous sedimentary rocks (Stewart and Carlson 1978). Jurassic (Middle Mesozoic) shale, sandstone, and volcanoclastic rocks crop out on the valley floor to the east of the study area.

The Desert Mountains are unusual in that they trend to the east and were uplifted primarily by folding rather than faulting and tilting, which is more common in the Basin and Range province. Landslides are common on the south flank of the Desert Mountains, where the basalt cover has slid over the underlying poorly consolidated Tertiary rocks.

Seismicity

The US Geological Survey estimates that there is about a 95 percent chance that peak bedrock acceleration in an earthquake would exceed 30 to 40 percent of the acceleration of gravity within the next 50 years in the project region (USGS 2002b). This is a moderately high bedrock acceleration. Ground shaking could be more intense in areas underlain by unconsolidated basin fill materials. The area is in Seismic Zone 4 (the highest zone rating) of the Uniform Building Code.

Mineral Resources

The study area is in the Yerington mining district, which includes the entire Singatse Range, the buttes in Mason Valley, and the northwestern Wassuk Range. The ore bodies in the Yerington District are primarily contact metamorphic replacement deposits in limey sedimentary rocks and porphyry copper deposits in plutonic rocks. Limestone crops out about two miles northwest of Wabuska. In the 1910s, a kiln operated here to produce lime from limestone (Moore 1969).

Soils

The principal soil type within the study area is Parran silty clay loam, which occurs on low terraces and in basins. The soil is very deep, nearly level, somewhat poorly drained,

strongly alkaline, and formed in clayey alluvium. Permeability is very slow, and runoff is very slow, creating ponding. The hot springs themselves are in soil classified as Dithod clay loam, wet – a very deep, poorly drained alluvial soil. The soil is strongly alkaline. The Parran soil is bordered by Orizaba soil, another strongly saline and alkaline soil similar to Parran soil. The Orizaba series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium. The Orizaba soils are on alluvial flats, lake plains, floodplains and beach plains. Slopes are 0 to 2 percent. Closer to the Desert Mountains is Malpais soil and soils of the Rawe-Malpais association. The Malpais series consists of very deep, well-drained soils that formed in alluvium and colluvium from mixed rock sources. Malpais soils are on alluvial fans and colluvial slopes bordering mountains. Slopes are 2 to 75 percent. The mean annual precipitation is about seven inches and the mean annual temperature is about 8 degrees Celsius (47 degrees Fahrenheit). Rawe soils are deep soils that formed on fan remnants. On the west side of the study area are Theon very gravelly sandy loam, which occurs on 8 to 30 percent slopes. The Theon series are very shallow and shallow, well-drained soils that formed in residuum and colluvium derived from volcanic rocks.

3.3 WATER RESOURCES

The following discussion refers to features that are illustrated on the topographic maps shown in Figures 2-1 through 2-8 in the preceding chapter.

Steamboat KGRA and Noncompetitive Lease Area

Climate

Annual precipitation in Washoe County ranges from less than 5 inches at elevations of 3,800 to 5,500 feet, to as much as 30 to 35 inches at elevations of 8,000 to 9,000 feet (Bonham 1969).

Surface Water

The study area is within the Truckee River Hydrographic Basin and encompasses the Washoe Valley, Pleasant Valley, and Truckee Meadows subbasins. The principal surface water features in the region are Washoe Lake and Little Washoe Lake, neither of which is within the lease area. Steamboat Creek, which heads in the watershed of Pleasant Valley, flows north toward Truckee Meadows. There is a low topographic divide separating Washoe Valley from Pleasant Valley. Washoe Lake, south of the Steamboat Hills, is a terminal lake during dry periods, but when runoff is plentiful, can overflow into Little Washoe Lake and then into Pleasant Valley. Browns Creek and streams farther south that drain the east slope of Mount Rose, west of Washoe City, flow to Washoe Lake. Jones Creek, which heads on the east slope of Mount Rose north of Browns Creek, drains to Pleasant Valley. Whites and Thomas creeks drain north of the lease area, into Truckee meadows. Relatively little runoff discharges from the Virginia Range east of Steamboat Creek into the Truckee Meadows subbasin.

One hundred-year floodplains can be found in western Nevada, so geothermal leases near water resources have the potential to be within a 100-year floodplain.

Groundwater

Groundwater beneath the Steamboat KGRA occurs in the basin fill, in bedrock fractures in the surrounding ranges, and in alluvial fans at the margins of the basin. The basin containing Washoe Lake is apparently hydraulically independent of the Reno basin, which contains Truckee Meadows. Pleasant Valley and Steamboat Valley are minor subbasins within the Reno basin. Recent groundwater studies indicate that the supply of groundwater in the Truckee Meadows basin, and in South Truckee Meadows in particular, is insufficient to meet currently anticipated needs (Widmer 2001; ECO:LOGIC Engineering 2002). Also, hot springs in the Steamboat area have been affected by past activities.

Hazen KGRA and Noncompetitive Lease Area

Climate

The Hazen KGRA is in the Carson Desert and is similar to that described below for the Soda Lake and the Stillwater areas (USGS 1995).

Surface Water

The study area is in the Carson Desert subbasin of the Carson River Hydrologic Basin. Surface water conditions in the Hazen KGRA are similar to those described for the Stillwater area, below. The northwest part of the Hazen KGRA contains low, marshy lands and wetlands of the Fernley State Wildlife Management Area (WMA), which occupies the Fernely Sink, in the Fortymile Desert. The wetlands are fed primarily by irrigation drain water from farmland surrounding Fernley, to the west. The eastern half of the KGRA is on higher ground, including the southwest portion of the Hot Springs Mountains. Surface drainage from these mountains is mainly toward the Fortymile Desert, except that a east of the town of Darwin, the surface drainage is eastward, into the Carson Desert.

The quality of the surface water in the Fernley WMA is poor, and the wetlands are subject to drying during drought periods, such as occurred from 1987 to 1994. According to studies by the US Geological Survey (Lico 1992), water in lakes in the Fernely WMA commonly exceeded state and federal drinking water standards for arsenic, boron, sodium, dissolved solids, and ammonia. Substances dissolved in the irrigation drain water accumulate on the sediments in the lakes and are enriched in arsenic, boron, mercury, lithium, molybdenum, selenium, and uranium compared with concentrations of these elements in background soils in the region.

One hundred-year floodplains can be found in western Nevada, so geothermal leases near water resources have the potential to be within a 100-year floodplain.

Groundwater

Groundwater conditions in the Hazen KGRA are expected to be generally the same as those described for the Stillwater KGRA, with a shallow water table in the western half of the area and relatively saline groundwater resulting from evaporation and concentration of salts in surface water derived from irrigation drainage.

Soda Lake KGRA

Climate

The average annual precipitation is less than 8 inches on the basin floor and about 16 inches on the surrounding ranges.

Surface Water

The Soda Lake KGRA lies within the Carson Desert Subbasin of the Carson River Hydrologic Unit. The Carson Desert is the terminal basin for the Carson River. Under natural conditions, the surface and groundwater inflow from the Carson River, and occasional overflow from the Humboldt Basin to the north of it, recharged the shallow saline lakes that occupy the Carson Sink. However, nearly all flows in the Carson River have been captured for irrigation, and recharge to the Carson Sink is now primarily due to irrigation return flows and irrigation seepage that occurs in the farming areas surrounding Fallon. Groundwater flows generally to the northeast beneath the study area, except where locally influenced by groundwater pumping.

Surface water occurs in the form of shallow, sometimes seasonal ponds that occupy local surface depressions (including Soda Lake) and in irrigation drainage canals. The ponds result from a shallow water table influenced by irrigation recharge.

In permanent, saline water bodies, dissolved salt concentrations tend to be quite high. For example, chloride concentrations in Soda Lake are in the range of 30,000 parts per million at the bottom of the lake, with lower concentrations near the surface. However, intermittent ponds occupying shallow depressions may contain much fresher water from precipitation and local inflows. For example, Chevron (1987) reported total dissolved solids concentrations in samples from six ephemeral ponds collected in 1983, ranging between 146 and 186 parts per million, suggesting that the water was potable.

One hundred-year floodplains can be found in western Nevada, so geothermal leases near water resources have the potential to be within a 100-year floodplain.

Groundwater

Depth to shallow groundwater averages about 10 to 25 feet in the area but ranges from greater than 25 feet south of the Upsal Hogback to 5 to 10 feet in the area about midway between Soda Lake and the Upsal Hogback (Maurer et al. 1994). Shallow nonthermal groundwater within the upper 200 feet of the surface has been described as segregated into three zones, based on chloride concentration (Olmsted et al. 1984). The upper zone is highly saline, due to the influence of irrigation return flows and evaporation. The middle zone is less saline, and the lower zone is again saline, perhaps due to contact with evaporite deposits. Unlike in the Stillwater area, a downward vertical gradient exists throughout the shallow nonthermal aquifer in the Soda Lake area.

Geothermal water rises from depths of greater than 10,000 feet into the intermediate aquifer to within 65 feet of the surface (Maurer et al. 1994). Geothermal water then mixes with nonthermal water of the intermediate aquifer and moves toward the Carson Sink. Near Soda Lake, it is estimated that about 800 acre-feet per year of thermal water rises to the intermediate aquifer, while near the Upsal Hogback, about 700 acre-feet per year is brought to a depth of about 800 feet below the surface, where it circulates within the basalt flows associated with the Upsal Hogback. The convection system circulates the water over a period of about 3,400 to 34,000 years near Soda Lake and over a period of about 25,000 to 35,000 years in the area beneath Upsal Hogback (Olmsted et al. 1984).

Stillwater KGRA

Climate

The Stillwater KGRA is in the Carson Desert, south of the Carson Sink. It is one of the warmest and driest areas of northern Nevada, with wide seasonal and daily variations in temperature and large variations in annual precipitation across the area. Average annual rainfall in the Carson Desert ranges from less than four inches in the Carson Sink to more than 16 inches in the Stillwater Range. Most precipitation occurs between

December and May, but there are short intense storms at other times of the year. Brief, violent windstorms are common in spring and early fall. The wind redistributes large amounts of dust and sand. Evaporation far exceeds rainfall, averaging nearly six feet per year. The growing season is about 125 days (Morgan 1982).

Surface Water

The study area is in the Carson Desert subbasin of the Carson River Hydrologic Basin. The Carson Sink is the lowest point in the terminal basin of the Carson Desert. Flow in the Carson River is regulated by Lahontan Reservoir releases. Most of the stored water is used for irrigation or is released for maintaining the wildlife preserves surrounding the Carson Sink. Recharge from irrigation seepage and irrigation return flows accounts for more than 150 times the estimated natural recharge from surrounding ranges. Groundwater levels increased by 45 to 60 feet during the period from 1905 to 1930 and this has led to the development of extensive permanent saline marshland surrounding the Carson Sink.

One hundred-year floodplains can be found in western Nevada, so geothermal leases near water resources have the potential to be within a 100-year floodplain.

Groundwater

The groundwater hydrology of the basin underlying the Stillwater KGRA is the result of its complex depositional history. This included periodic inundations by Lake Lahontan or smaller lakes, interspersed with dry periods in which sediments were reworked by winds and streams, and throughout which volcanic material, including ash, was periodically deposited. Morgan (1982) has defined seven hydrologic units in the basin, based on their aquifer characteristics. These include primary aquifers (consisting of coarse sands and gravels), marginal aquifers (containing fine material but still able to produce water, and confining beds (consisting of substantial clay sediments. Maurer et al. (1994) identified three aquifer units beneath the agricultural area surrounding Fallon: A shallow water table aquifer; an intermediate, relatively freshwater aquifer; and a deep aquifer. Depth to the water table ranges from 1.5 feet or less to about 15 feet in most of the study area (Morgan 1982; SCS 1975). Groundwater levels are slightly shallower on the northwest side compared to the southeast side of the area, indicating the influence of agricultural recharge (Maurer et al. 1994). Confined groundwater is under artesian pressure in many areas and rises above the ground surface elevation in wells that screen confined aquifers. Groundwater fluctuations range within about 6 feet, generally tracking irrigation releases. Highest groundwater levels tend to occur in spring. Of the 370,000 acre-feet per year released from Lahontan Reservoir from 1975 to 1992, the average inflow to the Carson Sink, Carson Lake, and the Stillwater WMA resulting from irrigation seepage, canal seepage, and irrigation return flows has been estimated to be about 170,000 to 190,000 acre-feet per year (Maurer et al. 1994).

Groundwater quality tends to improve with depth. Shallow unconfined groundwater in the Stillwater area contains dissolved solids concentrations averaging more than 16,000 milligrams per liter (mg/L). By comparison, the US EPA considers dissolved solids concentrations greater than about 1,000 mg/L to be unpotable. Groundwater from

depths of greater than 30 feet contains dissolved solids concentrations in the range of 6,000 mg/L. Deeper groundwater appears to be connected with, and mixes with, thermal water circulating at greater depths. Total geothermal upflow beneath the Carson Desert is estimated to be as much as 4,000 acre-feet per year (Maurer et al. 1994). The mixing probably occurs in fault-fractured zones. Groundwater with a temperatures ranging from 47 to 96 degrees Celsius (117 to 205 degrees Fahrenheit) indicates thermal mixing. Thermally mixed waters have an average dissolved solids concentration of about 4,000 mg/L (Morgan 1982). In other geothermal areas, thermal waters tend to be higher in dissolved salts than nonthermal waters, and the ratios of certain chemicals found in thermal waters, such as chloride and sodium, to fluoride and calcium found in nonthermal waters, tend to indicate where mixing is occurring. However, the chemical quality of the water is so strongly influenced by the dissolved solids from the playa evaporite deposits that the typical indicators may not be valid here.

Geothermal water circulates from a depth of about 10,000 feet into both the shallow and intermediate aquifers, affecting groundwater temperatures at depths of as little as 30 feet. About 1,400 to 2,500 acre-feet per year of thermal water upwell annually (Maurer et al. 1994).

Salt Wells KGRA and Noncompetitive Lease Area

Climate

The climate in the Salt Wells area is similar to that described for the Stillwater area.

Surface Water

On the east side of the Bunejug Mountains is the Salt Wells Basin, which is a terminal basin with a playa lake at its south end. Groundwater discharges to the surface within the playa, which extends about twelve miles along Highway 50, south of the town of Salt Wells. On the west side of the Bunejug Mountains, surface water drains to Carson Lake, another terminal lake, which receives much of its recharge from irrigation return flows from agricultural lands south of Fallon. Even though these are terminal basins, they are considered to be within the Carson Desert subregion of the Carson River Hydrographic Region.

One hundred-year floodplains can be found in western Nevada, so geothermal leases near water resources have the potential to be within a 100-year floodplain.

Groundwater

Groundwater quality is expected to be poor in the vicinity of Carson Lake. Dissolved solids concentrations of 1,000 mg/L have been reported in groundwater from the intermediate aquifer about two miles north of Carson Lake (Maurer et al. 1994). Near Carson Lake, geothermal water rises along faults from depths of greater than 8,000 feet to depths of about 1,000 to 1,500 feet in the deep and intermediate aquifers (Maurer et al. 1994). Near Salt Wells, geothermal water was tapped in a well at a depth of 700 feet.

Lee Hot Springs Noncompetitive Lease Area

Climate

The climate of the Lee Hot Springs area is not substantially different from that described above for the rest of the Carson Desert.

Surface Water

Most of the study area is within the Rawhide Flats subarea of the Central Hydrographic Region, which covers an area of over 157,000 acres (NDWP 2002). The Central Hydrographic Region is composed of a large number of independent internally drained basins throughout central Nevada. Surface drainage is generally toward Rawhide Flats. A small portion of the northwestern corner of the study area drains toward the northwest, into the Carson Desert hydrographic subbasin. There are no permanent surface water bodies in the study area. To the south of the study area Rawhide Flats contains a playa lakebed, which intermittently contains ponded water. In the northern part of the Rawhide Flats there are also some semi-isolated alkali flats, where surface water ponds and evaporates, leaving behind a residue of salts. Lee Hot Springs is along an intermittent wash that drains south from the White Throne Mountains toward Rawhide Flats. The quality of surface water decreases in contact with alkaline soils on the basin floor or with evaporite deposits associated with the playa lake bed. However, runoff from the basin margins, which is generally rapid, can be of good quality. Springs on the basin margin are associated with the contact between the alluvial fans and the lakebed deposits of the basin floor, which are less permeable. However, hot springs may be associated with convection systems that bring heated water to the surface from depth.

Groundwater

Rawhide Basin is a typical isolated basin and range groundwater basin surrounded by block-faulted ranges. These basins are generally hydraulically independent of each other. Typically the groundwater in the basin fill aquifers is poor in quality because salts accumulate in the basin sediments when the inflow from the surrounding ranges evaporates.

Aurora Crater Noncompetitive Lease Area

Climate

The climate in the area of Aurora Crater is similar to the Carson Desert, with average rainfall of approximately 8 to 10 inches per year (USGS 1995). Runoff from the west-facing slopes of the ranges is slightly greater than that from the east-facing slopes.

Surface Water

The study area is in the East Walker Area of the Walker River Hydrographic Basin. The East Walker Area covers about 375,000 acres. Surface water from the study area drains to Bodie Creek, west of Aurora Crater, and flows north to the East Walker River. Mud Spring Creek drains the north end of the study area, and several unnamed streams drain the south. There are no permanent water bodies in the study area.

Groundwater

Little information is available regarding groundwater conditions in the study area. Groundwater occurs at shallow depths near the principal streams. Most of the study area is underlain by volcanic flows or ejecta deposits. It is likely that groundwater occurs in bedrock fractures and possibly in multiple distinct permeable water-bearing units separated by clay beds deposited between volcanic events. Water quality is likely to be good in upland portions of the study area. Upward circulation and mixing of poorer quality geothermal waters from depth may reduce the quality of groundwater.

Wabuska Hot Springs Noncompetitive Lease Area

Climate

The climate in the study area is similar to that described above for the Carson Desert.

Surface Water

Wabuska Hot Springs is in the Mason Valley subbasin of the Walker River Hydrographic Basin. The Mason Valley subbasin covers an area of over 330,000 acres (NDWP 2002). Mason Valley is drained by the north-flowing East Walker River, which drains to Walker Lake in Mineral County. The northern portion of Mason Valley is poorly drained and contains numerous wetlands, saline lakes, and alkali flats. Wabuska Hot Springs is in the center of this poorly drained area. The area is also traversed by numerous irrigation drainage canals.

One hundred-year floodplains can be found in western Nevada, so geothermal leases near water resources have the potential to be within a 100-year floodplain.

Groundwater

Groundwater is at a shallow depth in the northern Mason Valley. Seasonal runoff from the Desert Mountains to the north and from surrounding uplands and water from irrigation drains recharge the basin fill. Upward convection of geothermal water mixes with the fresh recharge and comes to the surface at the hot springs. The groundwater is poor in quality from the accumulation of salts due to a high evaporation rate and poor drainage. Groundwater of higher quality can be found in the alluvial fans along the basin margin, in fractured bedrock, and in fresh springs that occur at the slope break where the range front meets the basin floor.

3.4 CULTURAL AND NATIVE AMERICAN RESOURCES

Cultural resources include prehistoric resources, Native American resources, and historic resources. Prehistoric resources are physical properties resulting from human activities that predate written records and are generally identified as isolated finds or sites. Prehistoric resources can include village sites, temporary camps, lithic scatters, roasting pits/hearths, milling features, petroglyphs, rock features, and burials.

Native American resources are sites, areas, and materials important to Native Americans for religious, spiritual, or traditional reasons. These resources may include villages, burials, petroglyphs, rock features, or spring locations. Fundamental to Native American religions is the belief in the sacred character of physical places, such as mountain peaks, springs, or burials. Traditional rituals often prescribe the use of particular native plants, animals, or minerals. Activities that may affect sacred areas, their accessibility, or the availability of materials or natural resources used in traditional practices are also considered when evaluating these areas.

Historic resources consist of physical properties, structures, or built items resulting from human activities that post-date written records normally associated with Euro-American use of the area. Historic resources can include archaeological remains and architectural structures. Historic archaeological site types include town sites, homesteads, agricultural or ranching features, trails, mining-related features, transportation features (such as roads), refuse concentrations, and features or artifacts associated with early military use of the land. Historic architectural resources can include houses, cabins, barns, railroad sidings, local structures, churches, post offices, meeting halls, or early military structures.

3.4.1 Cultural Resources Regulatory Background

Cultural resources are protected primarily through the National Historic Preservation Act (NHPA) of 1966 and its implementing regulations (36 CFR § 800), the Archaeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on properties listed on or eligible for listing on the National Register of Historic Places (NRHP). Criteria for inclusion on the NRHP are provided in 36 CFR § 60.4.

3.4.2 Native American Resources Regulatory Background

Section 101(d)(6)(A) of the NHPA allows properties of traditional religious and cultural importance to a tribe to be determined eligible for inclusion on the NRHP. The *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (Parker and King 1990) provide information on identifying, recording, and evaluating Native American sites that may be considered eligible for the NRHP and that are designated traditional cultural properties (TCPs). Some TCPs may also qualify as sacred sites under Executive Order 13007, which directs agencies, to the extent possible, to accommodate access to and use of such sites and to avoid adversely affecting their physical characteristics. The American Indian Religious Freedom Act of 1978 also allows for access to sites of religious importance to Native Americans. The Native American Graves Protection and Repatriation Act of 1990 provides for the repatriation of human remains and funerary items to identified Native American descendants.

3.5 BIOLOGICAL RESOURCES

3.5.1 Wildlife, Fisheries, and Migratory Birds

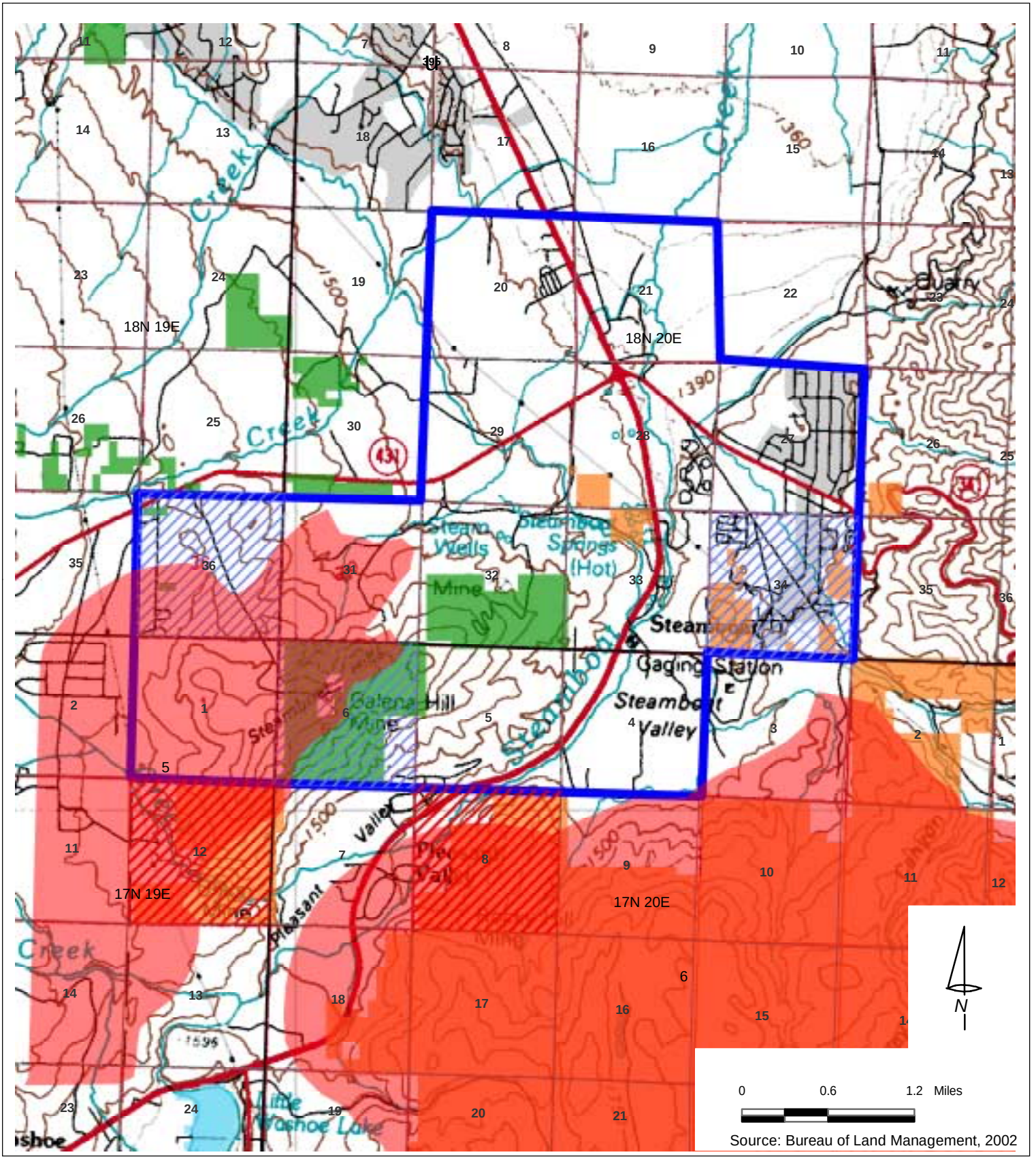
This section describes the general wildlife, fishery, and migratory bird resources occurring in the proposed leasing areas. Overall, there are a variety of game and nongame species typical of the Great Basin that may occur in the proposed lease areas. Several of the proposed lease sites are located within a major migratory bird flyway and as a result have a large variety of migratory birds including waterfowl and shorebird populations. Federally listed species and BLM sensitive species are discussed in Section 3.5.2.

Various wildlife species are used to indicate the functionality of the ecosystems present in the proposed lease sites and surrounding areas. The USFS uses the term management indicator species. In the proposed lease areas the mule deer and sage grouse have been identified as indicator species.

Steamboat KGRA and Noncompetitive Lease Area

Wildlife resources in the Steamboat lease area are typical of the flat valley bottom. Habitats such as salt desert shrub and dryland grease-wood shadscale support a variety of upland desert species. The area is bordered to the west by the Sierras, which are more vegetated and dominated by Jeffrey pine, and to the east by the Virginia Range, which are more arid and covered by pinyon and juniper. In addition, there is a small amount of riparian habitat within the Steamboat KGRA that may support riparian wildlife species. A number of different migratory bird species depend upon riparian habitats for breeding and nesting areas.

Mule deer is the major big game species found in this area. The southern portion of the Steamboat KGRA where leasing is proposed (T17N R19E sections 6 and 12; T17N R20E section 8; T18N R19E section 36) has been identified as a deer winter area (Figure 3.5-1). The carrying capacity if deer winter range is often considered critical to the deer herds in the western United States because the amount of accessible range for deer is restricted due to snow and the forage available may not be abundant or nutritious enough to support the animals. As a result, NDOW considers this habitat to be of key importance to deer populations (Washoe County 2000). The quality of deer habitat in the KGRA is decreasing annually, due to habitat fragmentation and wildfire. Section 8 has unburned vegetation left, but fires in 1985 and 2001 have burned all the way around it. Sections 6 and 12 burned in 2000. Washoe Hill in Section 18, over which US Highway 395 passes, burned in 1985. Prior to the burns, wintering deer would pass back and forth readily across US Interstate Highway 395. Since the burns, and installation of a "Jersey wall" (a three-and-a half-foot high concrete wall, with vertical plastic vanes adjusted to deflect headlight glare from oncoming vehicles), deer use has been minimal. The Jersey wall provides a virtually impassable barrier to deer, and they can get around it only at the top of the hill in the southeast corner of Section 13 or at the bottom in Section 18. The wall was constructed to reduce the number of automobile collisions.



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Legend

- KGRA Boundary
- KGRA Area Open to Competitive Lease
- Noncompetitive Lease Applications
- Deer Winter Range

Land Ownership

- Bureau of Land Management
- US Forest Service
- Private Lands
- Water

Tetra Tech, Inc

Deer Winter Range in The Steamboat Area

Carson City Field Office, Nevada

Figure 3.5-1

Hazen KGRA and Noncompetitive Lease Area

This area contains both upland and wetland habitats. A large portion of the Hazen KGRA and noncompetitive lease area is located within the Fernley State Wildlife Management Area. Wildlife occurring in this area range from upland game and nongame species such as coyote and kangaroo rat to wetland species such as waterfowl and migratory shore birds. It is unknown whether the wetlands contain nesting sites for migratory birds but it is likely. NDOW has identified the Fernley WMA as containing wetland, wildlife, and recreational resources (NDOW 2002).

Soda Lake KGRA and Noncompetitive Lease Area

Portions of the Soda Lake KGRA and Noncompetitive lease area are located within the Stillwater WMA and Stillwater NWR, and adjacent to the Fallon NWR. The Stillwater NWR complex contains large upland and wetland habitats and provides important habitat for migratory waterfowl, shorebirds and upland bird species which are protected under the Migratory Bird Treaty Act (MBTA). Additional information on this area is provided below under the Stillwater KGRA.

Stillwater KGRA

Portions of the Stillwater KGRA are within the Stillwater NWR and adjacent to the Stillwater WMA. The Stillwater wetlands are an area which has been designated a site of international importance by the Western Hemispheric Shorebird Reserve Network because of the hundreds of thousands of shorebirds, such as long-billed dowitcher, black-necked stilt, and American avocet passing through during migration. The Stillwater NWR is also listed as a Globally Important Bird Area by the American Bird Conservancy, more than 280 species have been sited in the area including American white pelicans, double-crested cormorant, white-faced ibis, and several species of egrets, herons, gulls and terns. (USFWS 2002). From a regulatory standpoint, this area contains significant resources protected under the MBTA.

Salt Wells KGRA and Noncompetitive Lease Area

This area contains both upland and wetland wildlife species, as described above. This area includes a portion of Carson Lake, which contains important wetland habitats. As a result, migratory birds are common to this area.

Lee Hot Springs Noncompetitive Lease Area

This area is predominantly upland desert habitat such as salt desert scrub, as described above. Wildlife in this area consists of upland species adapted to dry conditions with limited vegetative cover.

Aurora Crater Noncompetitive Lease Area

Wildlife in this area ranges from big game species to shrews, bats, weasels, cats, rodents, and rabbits. This area contains antelope summer range habitat (BLM 1976b) and is within the critical range of the Desert bighorn sheep *(Ovis canadensis nelsoni)* (BLM 2001b). A deer winter area has been identified to the north of the Aurora Crater noncompetitive lease area.

Wabuska Noncompetitive Lease Area

The area is dominated by black greasewood and shadscale, except for the slough areas that hold Walker River overflows. Water from the overflows does not remain yearlong. Common mammal species include coyote, black-tailed jackrabbit, Harris antelope, and ground squirrel; raptors include golden eagle and red-tailed hawk. The sloughs attract a wide variety of game and nongame waterfowl and shorebirds. The only trees in the area are some cottonwoods several miles east. The Mason Valley WMA is several miles to the southeast of the proposed lease area.

3.5.2 Federally Listed Endangered and Threatened Species and BLM Sensitive Species

The USFWS has identified three federally listed endangered and threatened species as potentially occurring in the proposed lease areas or as being affected by geothermal leasing activities. A list of federally listed endangered and threatened species that may occur in the Steamboat, Hazen, Soda Lake, Stillwater, and Salt Wells KGRA and noncompetitive lease areas was obtained from the USFWS in September 2001. Listed species that may occur in the Lee Hot Springs, Aurora Crater, and Wabuska noncompetitive lease areas were identified in a letter from USFWS on June 3, 2002; the species identified were the Steamboat buckwheat *(Erogonum ovalifolium* var. *williamsiae),* Lahontan cutthroat *(Oncorhynchus clarkii henshawi),* and bald eagle *(Heliaeetus leucocephalus)* potentially occurring in the Steamboat, Aurora Crater, and Stillwater proposed lease areas, respectively.

The BLM maintains a list of special status species that it considers when making management decisions and assessing environmental impacts. The species that may occur within the proposed lease areas were identified through a search of the Nevada Natural Heritage Program database (NNHP 2002), two USFWS letters (2001, 2002), and comments to the draft EA provided by BLM resource personnel, USFWS, and US Forest Service (USFS). These species are presented in Table 3.5-1.

Steamboat KGRA and Noncompetitive Lease Area

Steamboat buckwheat is a federally listed endangered plant (51 Fed. Reg 24669) and has also been placed on the Nevada list of Critically Endangered plants (NRS 527.260-.300). The natural occurrence of this species is limited to land at Steamboat Hot Springs. The global habitat for the Steamboat buckwheat covers less than 250 acres, all located at the intersection of US 395 and the Mt. Rose Highway. Specifically, the buckwheat occurs in portions of sections 28, 29 and 33 of T18N R20E. The metapopulation is fragmented into an estimated seven colonies. Habitat for this species is under multiple ownership (Knight 1993). The BLM owns approximately 98 acres of the total population (BLM 1983). Out of this 40 acres of BLM land were designated as an area of critical environmental concern (ACEC). This ACEC is in close proximity to the proposed Steamboat lease area.

Hazen KGRA and Noncompetitive Lease Area

No federally listed endangered, threatened, or candidate are known to occur in this area.

Table 3.5-1
Federally Listed Endangered and Threatened Species and Sensitive Species that May Occur in the Proposed Lease Areas

Common Name	Scientific Name	Status Federal[2]/State[3]/BLM[4]/FS[5]	Lease Area[1]
Federally Listed Endangered or Threatened Species			
Steamboat buckwheat	*Erogonum ovalifolium* var. *williamsiae*	E/E/S/E	1
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	T/S3/S/T	7
Bald eagle	*Haliaeetus leucocephalus*	T/S1B/S/T	4
BLM Special Status Species and Federal Species of Special Concern			
Plants			
Bodie Hills rockcress	*Arabis bodiensis*	FSC/S2/NC/SI	7
Bodie Hills draba	*Cusickiella quadricostata*	FSC/S2/NC/SW	7
Oryctes	*Oryctes nevadensis*	FSC/--/N/--	3
Mono County phacelia	*Phacelia monoensis*	FSC/S3/NC/SI	7
Lavin egg milkvetch	*Astragalus oophorus* var. *lavinii*	FSC/S2/N/SW	7
Galena Creek rockcress	*Arabis rigidissima* var. *demota*	--/S2/--/S	1
Altered andesite buckwheat	*Eriogonum robustum*	FSC/S2S3/N/--	1
Steamboat monkeyflower	*Mimulus ovatus*	--/S1S2/--/--	1
Sand cholla	*Opuntia pulchella*	--/S2S3/--/--	3
Desert sunflower	*Helianthus deserticola*	--/S2/--/--	3
Invertebrates			
Wong's springsnail	*Pyrgulopsis wongi*	FSC/S1/N/I	7
Hardy's aegialian scarab beetle	*Aegialia hardyi*	FSC/S1/N/--	6
Sand Mountain aphodius scarab	*Aphodius* sp.	FSC/--/--/--	6
Sand Mountain serican scarab	*Serica psammobunus*	FSC/S1/N/--	6
Sand Mountain blue butterfly	*Euphilotes pallescens arenamontana*	FSC/S1/N/--	6
Nevada viceroy	*Limenitis archippis lahontani*	FSC/--/N/--	2,4
Birds			
Western burrowing owl	*Athene cunicularia hypugea*	FSC/S3B//--P	All
Northern goshawk	*Accipiter gentilis*	FSC/S3/P/SI	1,3,4,7
Sage grouse	*Centrocercus urophasianus*	FSC/S4/N/--	4,7
White-faced ibis	*Plegadis chihi*	FSC/S3B/P/--	4
Long-billed curlew	*Numenius americanus*	--/S3?B/P/--	4
Mammals			
Pygmy rabbit	*Brachylagus idahoensis*	FSC/S3/-/---	All
Fletcher dark kangaroo mouse	*Microdipodops megacephalus nasutus*	FSC/S2/--/--	7
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	FSC/S3B/N/SI	All
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	FSC/S3B/N/SI	All
Spotted bat	*Euderma maculatum*	FSC/S1S2/S/S	All

Table 3.5-1
Federally Listed Endangered and Threatened Species and Sensitive Species that May Occur in the Proposed Lease Areas *(continued)*

Common Name	Scientific Name	Status Federal[2]/State[3]/BLM[4]/FS[5]	Lease Area[1]
Small-footed myotis	*Myotis ciliolabrum*	FSC/S3B/N/--	All
Long-eared myotis	*Myotis evotis*	FSC/S4B/N/--	All
Fringed myotis	*Myotis thysanodes*	FSC/S2B/N/--	All
Long-legged myotis	*Myotis volans*	FSC/S4B/N/--	All
Yuma myotis	*Myotis yumanensis*	FSC/S4B/N/--	1,2,6,7,8
Pallid bat	*Antrozous pallidus*	--/S3B/--/I	5

Source : USFWS 2001, 2002 and comments to draft EA, Nevada Natural Heritage Program 2002, and USFS comments to draft EA

Notes:
[1]Lease area
1 = Steamboat KGRA and noncompetitive lease area
2 = Hazen KGRA and noncompetitive lease area
3 = Soda Lake KGRA and noncompetitive lease area
4 = Stillwater KGRA
5 = Salt Wells KGRA and noncompetitive lease area
6 = Lee Hot Springs noncompetitive lease area
7 = Aurora Crater noncompetitive lease area
8 = Wabuska noncompetitive lease area

[2]Federal status:
E = Endangered under the ESA
T = Threatened under the ESA
FSC = Species of Concern (there is no regulatory status associated with this designation)

[3]Nevada state status
S1 = Critically imperiled due to extreme rarity, imminent threats, and or biological factors
S2 = Imperiled due to rarity and/or other demonstrable factors
S3 = Rare and local throughout its range, or with very restricted range, or otherwise vulnerable to extinction
S4 = Apparently secure, though frequently quite rare in parts of its range, especially at its periphery
B = Breeding status within the state, rank for breeding occurrences only

[4]BLM status
S = Nevada special status species – USFWS listed, proposed or candidate for listing, or protected by Nevada state law
N = Nevada special status species – designated sensitive by state office
P = Proposed Nevada special status species – designated proposed Sensitive by state office
C = California special status species (see definitions S and N).

[5]Forest Service status - (Applies to USFS lands in the Steamboat and Aurora lease areas)
S=Region 4 sensitive species
I = Region 5 sensitive species
W = Region 5 watch species

Soda Lake KGRA and Noncompetitive Lease Area

No federally listed endangered, threatened, or candidate are known to occur in this area.

Stillwater KGRA

The Federally listed threatened bald eagle (*Haliaeetus leucocephalus*) may occur in this area. The USFWS letter, September 13, 2001 states that Section 7 consultation under the ESA would be required for development activities in the Stillwater KGRA. The bald eagle is also listed as a Nevada state protected species.

The sage grouse is a federal species of concern, which should be considered when evaluating geothermal leasing activities in this area. Although habitat within the lease area may be limited, sage grouse may occur in the surrounding areas.

Salt Wells KGRA and Noncompetitive Lease Area

No federally listed endangered, threatened, or candidate are known to occur in this area.

Lee Hot Springs Noncompetitive Lease Area

No federally listed endangered, threatened, or candidate are known to occur in this area.

Sand cholla, a federal species of concern, has been documented near this area. Cacti most likely also occur in this area. Cacti are not a state or federally protected species, but the state of Nevada considers all cacti important and provides protection for cactus species. All members of the cactus family (Cactaceae) are protected under Nevada Revised Statutes (NRS) 527.060-120. The NRS states that "Any person proposing to remove any Christmas tree, cactus, or yucca for commercial purposes on any state, county, or privately owned lands shall notify the state forester fire warden." A permit would be required for this activity.

Aurora Crater Noncompetitive Lease Area

A portion of the proposed lease area is within the watershed for Bodie Creek, which contains potentially suitable habitat for Lahontan cutthroat trout. As such, the area may be necessary for the species' recovery. The Walker River Recover Implementation Tram (WRRIT) will be evaluating areas within this basin, which could support the Lahontan cutthroat trout, although a self-sustaining population is not currently present in the project area.

A portion of the Aurora Crater noncompetitive lease area is known as a Sage Grouse early brood/nesting area (Figure 3.5-2). The area contains key habitat for sage grouse including one lek site (territorial breeding ground) in the Mud Springs area. Three additional leks are known to occur within one mile south of Aurora Peak on the south end of the lease area.

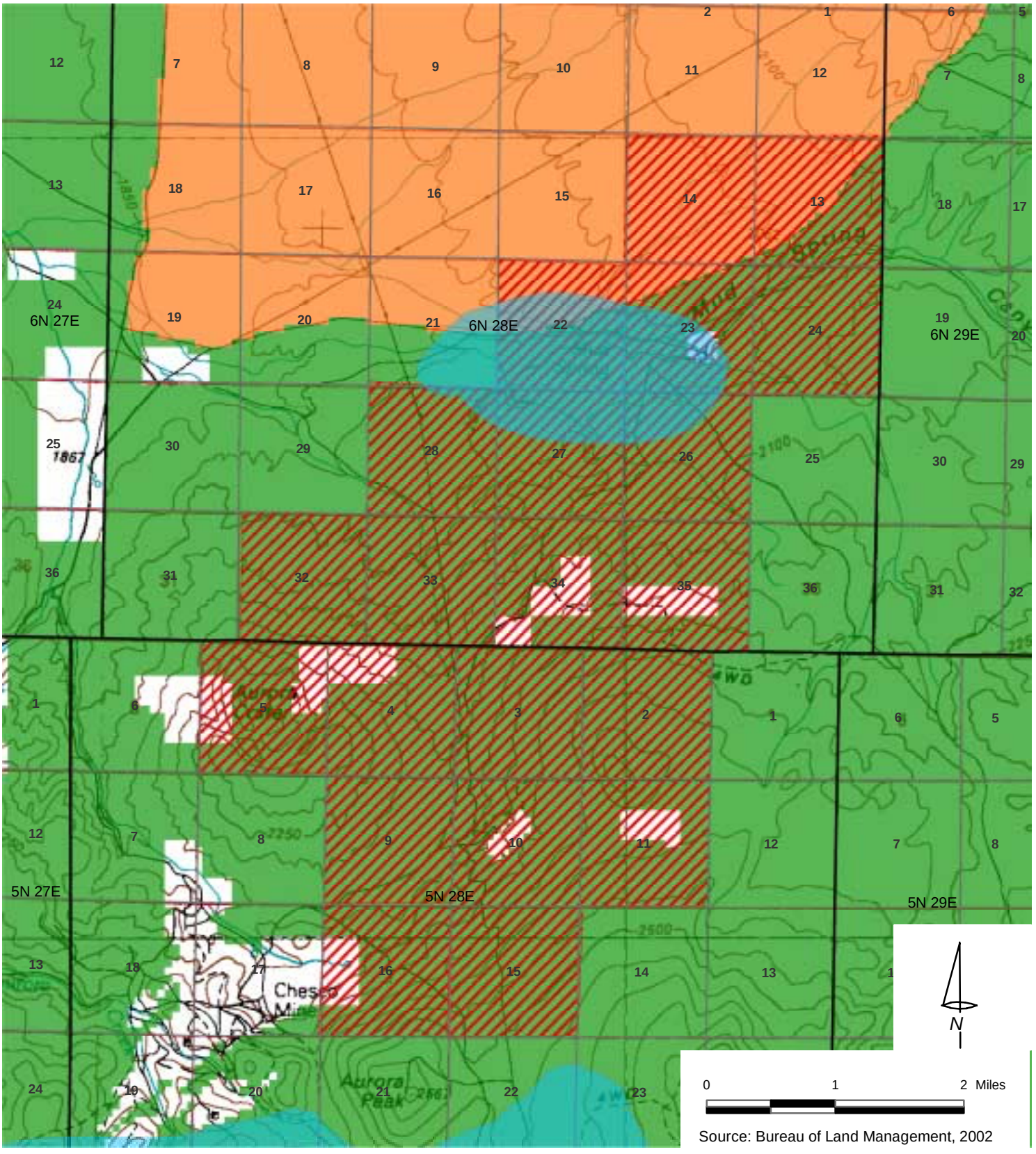
In addition the USFS has identified three sensitive plant speices known to occur in the area. These species are the Lavin's egg milkvetch (*Astragalus oophorus*), Bodie Hills draba (*Cusikiella quadricostata*), and Mono phacelia (*Phacelia monoensis*).

Wabuska Noncompetitive Lease Area

No federally listed endangered, threatened, or candidate are known to occur in this area.

3.5.3 Vegetation, Riparian Areas, and Noxious Weeds

In general, vegetation found in the proposed lease areas are typical of the Great Basin. Vegetation varies from salt-tolerant shrubs and grasses that inhabit the valley bottoms to pinyon and juniper in the higher mountain ranges near Steamboat and Aurora Crater.



Source: Bureau of Land Management, 2002

P:\A000thruR000\K836-Geothermal_EA\GIS\Sage Grouse_Aurora_Crater.mxd - TG - 7/30/02

Legend

- Noncompetitive Lease Applications
- Early Brood/Nesting Area

Land Ownership

- Bureau of Land Management
- US Forest Service
- Private Lands

Sage Grouse in The Aurora Area

Carson City Field Office, Nevada

Figure 3.5-2

Tetra Tech, Inc

In addition, several riparian communities are present throughout the project area. The USFWS have defined wetlands in the Lahontan Valley portion of the area as primary and secondary. Primary wetlands in proximity to the project area include the Stillwater National Wildlife Refuge, Carson Lake, and Fallon Indian Reservation. Secondary wetlands are administered or owned by another agency, organization, or individual. The term "secondary" is not an indication of quality or importance of wetland habitat but indicates those that are not designated Lahontan Valley wetlands under the Settlement Act, PL 101-618. Secondary wetlands in the vicinity of the project area include those associated with the Fernley Wildlife Management Area, Soda Lakes, and Indian Lakes (USFWS 1995).

Noxious weeds can be found throughout the proposed lease area. Nonnative invasive species are considered a limiting factor for the success of native plant communities. Problematic species include Russian knapweed, hoary cress or white-top, perennial pepperweed or tall whitetop, puncture vine, and yellow starthistle (SAIC 2000; US Navy 1991). In addition, tamarisk has become a serious problem in many of the wetland areas near the Stillwater National Wildlife Refuge Complex. This would likely affect the Stillwater and Soda Lake proposed lease areas.

Steamboat KGRA and Noncompetitive Lease Area

The Steamboat KGRA is characterized by the Steamboat Hills and surrounding valleys, bordered to the west by the Sierras, which are more vegetated and dominated by Jeffrey pine, and to the east by the Virginia Range, which is more arid and covered by pinyon and juniper. Valley bottom vegetation is typically dominated by Wyoming big sagebrush. Other shrubs include four-wing saltbush and shadscale (BLM 1976c).

In addition, there is a relatively small amount of riparian habitat found within the Steamboat KGRA. Riparian habitat typically contains Fremont cottonwood and willow tree species with shrubs including basin big sagebrush and rubber rabbit-brush. Grasses include wild ryes, alkali sacaton, and salt grass (BLM 1976b). Efforts are ongoing to control tall whitetop *(Lepidiam latifolium)* and other invasive species in this region.

The Steamboat KGRA contains a population of the federally endangered Steamboat buckwheat, which is further discussed in the threatened and endangered species section.

Hazen KGRA and Noncompetitive Lease Area

The Hazen KGRA is within an area of low-rolling, arid terrain covered predominantly with Russian thistle and greasewood. Greasewood habitat typically contains big greasewood, green molly, quailbush, and red sage. Russian thistle, halogeton, and cheatgrass are common noxious weeds in greasewood habitats. Additionally, a portion of the area contains wetland habitats. Portions of the Fernley Wildlife Management Area are located within the Hazen lease area. These areas are managed for wildlife habitat by NDOW.

Soda Lake KGRA and Noncompetitive Lease Area

The Soda Lake KGRA is within an area of low-rolling, arid terrain covered with Russian thistle and greasewood. Greasewood habitat typically contains big greasewood,

green molly, quailbush, and red sage. Russian thistle, halogeton, and cheatgrass are common noxious weeds in greasewood habitats. There is some wetland habitat found in this area. Wetland habitat is typically freshwater marsh. Emergent wetland vegetation may include hardstem bulrush, alkali bulrush, and cattail. Common submergent vegetation species include sago pondweed, widgeongrass, muskgrass and coontail. These surrounding lands include the Stillwater WMA and the Fallon NWR.

Stillwater KGRA

This area is dominated by the Carson Sink playa, which tends to have little topographic relief. The eastern side of the playa is bounded by the Stillwater Mountains, while the West Humboldt Mountain Range bounds the northern and western sides of the playa. The area is generally dominated by greasewood. Several wetlands are located in the Stillwater KGRA. These wetlands would be similar in composition to those described for the Soda Lake KGRA.

Salt Wells KGRA and Noncompetitive Lease Area

The area containing the Salt Wells KGRA and the surrounding noncompetitive lease areas has little topographic relief, ranging from valleys to relatively small, rolling mountains. Shade-scale is the dominant vegetation. Other vegetation communities are typical of those in the Great Basin region. In general, vegetation in the valley bottoms consist of salt-tolerant shrubs and grasses. This community transitions into pinyon-juniper in higher elevations. The Salt Wells area includes a portion of Carson Lake and associated wetland vegetation.

Lee Hot Springs Noncompetitive Lease Area

Vegetation communities are typical of those found in the Great Basin Region. The Lee Hot Springs area vegetation consists predominantly of salt-tolerant shrubs (also known as salt desert scrub) and grasses. Plant communities of salt desert scrub can vary greatly in species composition and biomass depending on level of salinity in the soils. Little vegetation may exist on the most saline areas, and as soil conditions improve a greater diversity of shrubs, perennial grasses and some forbs may occur. Potentially occurring species in this area would include greasewood, spiny hopsage, budsage, saltbush, winterfat, basin wildrye and Indian ricegrass.

Aurora Crater Noncompetitive Lease Area

The Aurora Crater lease area generally ranges from valley bottoms to rugged mountain areas. The Borealis series soils in this area support native vegetation consisting of a forest canopy of singleleaf pinyon and an understory of desert bitterbrush, green ephedra, bottlebrush squirreltail, Indian ricegrass, and Wyoming big sagebrush. Jeffrey Pine, red fir, and juniper are also likely to occur in the area.

Wabuska Noncompetitive Lease Area

The area is dominated by black greasewood and shadscale, except for the sloughs that hold Walker River overflows. The sloughs do not hold water yearlong. Also, lowland riparian is found in the southern portion of the lease area.

3.6 VISUAL RESOURCES

This section describes the regulations that protect the aesthetic quality of public land and the visual resources of land in the region of influence for the proposed action. The region of influence for visual resources includes the areas within and surrounding proposed geothermal lease areas.

In accordance with FLPMA, BLM is entrusted with the multiple-use management of natural resources on public land, which contain many outstanding qualities, including scenic landscapes. In managing the public lands for multiple uses, the BLM is constrained by the legal mandate to "protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values…and provide for…human occupancy and use" (BLM 2002b).

BLM is responsible for ensuring that the scenic values of public lands are considered before allowing uses that may have negative visual impacts. BLM addresses this through its Visual Resource Management (VRM) system. The VRM system involves two stages—the visual resource inventory stage (described in BLM Handbook H-8410-1, *Visual Resource Inventory*) and then the visual resource contrast rating stage (described in BLM Handbook H-8431-1, *Visual Resource Contrast Rating*) (BLM 2002c). The inventory stage involves identifying the visual resources of an area. The results of the visual resource inventory become an important component of BLM's Resource Management Plan (RMP) for an area because the RMP establishes how the public lands will be used and allocated for different purposes. The visual values of an area are used in the RMP process to assign VRM classes with management objectives to an area's visual resources. The four VRM classes and management objectives consist of the following (BLM 2002c):

- Class I Objective—"To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention."
- Class II Objective—"To retain the existing character of the landscape. The level of change to the characteristic landscape should be low."
- Class III Objective—"To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate."
- Class IV Objective—"To provide for management activities, which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high."

The CCFO CRMP identifies the lands with VRM classes in the CCFO management area. Out of the 37 areas designated with VRM classes, only BLM land in the Highway 395 South area is affected by the proposed action (Callan 2002a). This area has a VRM Class III designation.

According to BLM policy, interim VRM classes can be adopted. For the purpose of this document, all BLM lands in the vicinity of the proposed leasing area are assumed to have a VRM Class III designation in order to have a standard against which project actions on geothermal lease land can be assessed (Knight 2002).

The analysis stage involves determining whether potential visual impacts from proposed surface-disturbing activities or developments would conform to management objectives established for the area, or whether project design adjustments would be required. The visual contrast rating process used for this analysis involves comparing the project features with the major features in the existing landscape from key observation points using the basic design elements of form, line, color, and texture. The four design elements and guidance for assessing contrast are described as follows (BLM 2002c):

- Form—"Contrast in form results from changes in the shape and mass of landforms or structures. The degree of change depends on how dissimilar the introduced forms are to those continuing to exist in the landscape."
- Line—"Contrasts in line results from changes in edge types and interruption or introduction of edges, bands, and silhouette lines. New lines may differ in their subelements (boldness, complexity, and orientation) from existing lines."
- Color—"Changes in value and hue tend to create the greatest contrast. Other factors, such as chroma, reflectivity, color temperature, also increase the contrast."
- Texture—"Noticeable contrast in texture usually stems from differences in the grain, density, and internal contrast. Other factors, such as irregularity and directional patterns of texture, may affect the rating."

Using the analysis as a guide, attempts can be made to reduce visual impacts caused by a project. Once every attempt has been made to reduce visual impacts, BLM managers can decide whether to accept or deny project proposals.

Steamboat KGRA and Noncompetitive Lease Area

The Steamboat KGRA and noncompetitive lease area are in the Washoe Valley of Washoe County. Human settlements and roads disrupt the natural impression of this area. Washoe Lake and the snow-capped peaks of the Sierra are the main accentuating features of Washoe Valley. The backdrop of the valley is composed of the Jeffrey pine-covered Sierra Nevada Mountains to the west and the pinyon- and juniper-covered Virginia Range, five miles to the east. The Sierra Nevadas are green with lush vegetation, and the Virginia Range supports only vegetation adapted to arid climates (BLM 1974d). The Steamboat Hills are the visually dominant landscape feature in this part of the Truckee Meadows. BLM land in the Highway 395 South area is part of the Steamboat KGRA and noncompetitive lease area and has a VRM Class III designation (BLM 2001b).

According to the Washoe County Scenic Resources Map in the Conservation Element of the Washoe County Comprehensive Plan, the closest scenic resources to the Steamboat KGRA and noncompetitive lease area are Mt. Rose to the west and Washoe Lake Dunes to the south. The Steamboat KGRA is in the area of Steamboat Hills and Steamboat Creek and its tributaries. The Steamboat Hills area is composed of sparse clusters of pine trees and moderately colorful rock formations. The creek and tributaries support riparian vegetation and habitat for animals. Willow clusters, cottonwoods, and scrub are found in limited areas along the creek. Alfalfa fields, wet meadows, and some scrub grass are also found on nearby land (Washoe County 1994).

The Mount Rose Highway (State Route 431), a scenic byway north and west of the proposed action, climbs Mount Rose Summit to the 8,911-foot pass, the highest in the state. It then descends into the Lake Tahoe Basin (Nevada Department of Transportation 2002).

Portions of the project area are in the Humboldt-Toiyabe National Forest. These lands were acquired from the BLM in 1989 and are still managed pursuant to the BLM planning direction from the 1980 Reno Management Framework Plan, which designates the area as a VRM Class III. The Forest Service is proposing to upgrade the area to a high scenic integrity class through the Northern Sierra Plan Amendment. A final decision is expected within six months.

Hazen KGRA and Noncompetitive Lease Area

With the exception of the Steamboat KGRA and Aurora Crater noncompetitive lease area, the geothermal lease areas are in the Great Basin, which can be described as expansive. The often barren, but frequently colorful, elongated and steep mountain ranges provide unobstructed panoramic views of the Great Basin area. The mountain ranges parallel sun-saturated, brush-strewn valley floors interspersed with barren, bleached alkali playas (BLM 1974a). Higher elevations support sagebrush, juniper, and pinyon pine. This vegetation provides visual diversity and contrasting darker color along ridgelines in the distant background. Vegetation on the valley floor grows low and evenly and primarily consists of monochromatic desert brush (US Navy 2000). Although the areas are sparsely populated, fences, utility lines, roads (paved and dirt), historic trails, trailer houses, mines, and road signs are present (BLM 1974a).

The form, line, color, and texture of the Great Basin landscape are influenced by the arid climate. The hills are gold and brown, and the blue sky can be dotted with fluffy clouds and thunder clouds at times. Sunlight is a dominating element in the area, and whirling winds create dust funnels (US Navy 2000; BLM 1974a).

The Hazen KGRA and noncompetitive lease area are northwest of Fallon. There are no protruding mountain ranges or expansive valleys northwest of Fallon. Russian thistle and greasewood are scattered across low-rolling pebble-paved terrain (BLM 1974a).

Soda Lake KGRA and Noncompetitive Lease Area

The Soda Lake KGRA and noncompetitive lease area are characteristic of the Great Basin environment described above. The lease areas are northwest of Fallon. There are no protruding mountain ranges or expansive valleys northwest of Fallon. Russian thistle and greasewood are scattered across low-rolling pebble-paved terrain (BLM 1974a).

Stillwater KGRA and Noncompetitive Lease Area

The Stillwater KGRA and noncompetitive lease area are characteristic of the Great Basin environment described above. The lease areas are in the Carson Sink west of the Stillwater Range. Stillwater is the closest town and is fringed with extensive irrigated cropland and ranches (BLM 1974a). Areas in the Stillwater Range are ranked as having above-average scenery (BLM 2001b).

Salt Wells KGRA and Noncompetitive Lease Area

The Salt Wells KGRA and noncompetitive lease area are characteristic of the Great Basin environment described above. The lease areas are south of Fallon and immediately east of Carson Lake. Much of the shadescale-covered land south of Fallon is desolate, and the bordering mountains are small and smooth (BLM 1974a).

Lee Hot Springs Noncompetitive Lease Area

The Lee Hot Springs noncompetitive lease area is characteristic of the Great Basin environment described above. The lease area is immediately northwest of the Fallon Naval Air Station. Green trees, grasses, and herbs distinguish this area from the rest of the landscape (BLM 1974a).

Aurora Crater Noncompetitive Lease Area

The Aurora Crater noncompetitive lease area is in the Humboldt-Toiyabe National Forest. The lease land is on the edge of the forest. The forest contains big sage and black sage-dominated valley bottoms that merge into a backdrop of steep rugged mountains. Numerous springs and creeks are found in the mountains, which are covered with pinyon, Jeffrey pine, red fir, and juniper (BLM 1974c). Mining sites are nearby, and unimproved roads crisscross the lease area (USFS 2002).

Portions of the project area are in the Humboldt-Toiyabe National Forest. In the *Land Resource Management Plan* for the Toiyabe National Forest, the management of visual resources is addressed (US Department of Agriculture 1986). One of the goals is to manage the forest landscape with a sensitivity to visual quality. Also, maintaining or creating an environment that is visually pleasing and that resembles a natural setting is one of the vegetation management objectives. More specific visual quality objects for the forest are being prepared as part of an update of the *Land Resource Management Plan* (Lamoreux 2002).

Wabuska Noncompetitive Lease Area

The Wabuska noncompetitive lease area is characteristic of the Great Basin environment described above. The lease area is in the area of the Desert Mountains. The mountains, some of which rise 2,000 feet above the desert floor, are treeless (BLM 1974a).

3.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The KGRAs and other leasing areas are within four Nevada counties: Churchill, Mineral, Lyon, and Washoe. The economies of these counties could be affected by geothermal leasing, so demographic, economic, and social data are presented for these counties and for the city of Reno, where applicable. Reno is the largest city in Washoe County and in the region described. The most recent data available at the time of this analysis is supplied for each topic.

Socioeconomic resources include population, employment, income, housing, earnings, and schools. Population is the number of residents in the area and the recent change in population growth; employment data takes into account labor sectors, labor force, and statistics on unemployment; income information is provided as an annual total by county and as per capita income; housing includes numbers of units, ownership, and vacancy rate; earnings-by-industry provides a measure of the health of local business activity; and school enrollment and capacity are important considerations in assessing the effects of potential growth.

Population

Between 1990 and 2000 the population in Churchill, Lyon, and Washoe counties increased, while the population of Mineral County declined by 21.7 percent. Lyon County experienced the largest increase (72.5 percent) (Table 3.7-1). Washoe County, which includes the Reno-Sparks metropolitan statistical area (MSA), had the largest population in both 1990 and 2000, with a large portion of the population (53.2 percent) within the Reno metropolitan statistical area. Mineral County is the least populous county within the project area, with a total population of 5,071 in 2000 (US Census 1990a, 2000b).

Table 3.7-1
Population

	1990	2000	% Change 1990-2000
Churchill County	17,938	23,982	33.7%
Lyon County	20,001	34,501	72.5%
Mineral County	6,475	5,071	-21.7%
Washoe County	254,667	339,486	33.3%
Reno MSA	133,850	180,480	34.8%

US Census Bureau 1990a, 2000b

The source of much of the population growth in Churchill, Lyon, and Washoe counties has been from in-migration. The population of Churchill County is projected to grow by 10,737 (an annual average increase of 3.3 percent) by 2010, and Lyon County is expected to grow by 14,840 (an annual average increase of 3.3 percent). Mineral County is expected to continue to experience a decline in population from 2000 to 2010 of 604 (an annual average decrease of 0.9 percent). The population of Washoe County is expected to increase by 66,792 (an annual average increase of 1.7 percent) (Nevada State Demographer's Office 2000).

Employment and Economy

In 2001 Washoe County had the largest labor force (175,497) and highest employment rate (95.9) of the four project area counties. Mineral County had the smallest labor force (1,830) in 2001, with 91.4 percent employment, and Churchill County, with a labor force of 9,035, had the highest unemployment rate of 8.7 percent. Between 1992 and 2001, labor force, employment, and unemployment declined in Mineral County (by 42.4, 44.4, and 6.0 percent, respectively). During this period unemployment increased by 23.5 percent in Churchill County, and unemployment decreased by 22.5 percent in Washoe County. The largest increase in labor force and employment between 1992 and 2001 occurred in Lyon County, at 39.1 percent and 42.6 percent (BLS Undated).

As shown in Table 3.7-2, between 1990 and 2000, the greatest increases in employment in each of the four project area counties occurred in the finance/insurance/real estate sector. Mining and extractive industries experienced the largest decrease in employment in Churchill and Washoe counties (-38.1 percent and -49.4 percent) and the smallest increase in employment (1.0 percent) in Lyon County. Mineral County experienced a 20.0 percent decline in total employment between 1990 and 2000, whereas total employment in Churchill, Lyon, and Washoe counties increased over this period. In 2000 services (3,996) and government (3,073) employed the most workers in Churchill County, and the highest employment in Lyon County was in services (3,809) and trade (3,118). In Mineral County government (531 employees) and trade (352 employees) employed the largest portion of the labor force. Services and trade had the highest employment levels in Washoe County (93,459 and 50,548), with finance/insurance/real estate and government also employing a substantial portion of the labor force (24,212 and 22,617) (BEA 2001b).

The top five employers in Churchill County include the Churchill County School District, Churchill Community Hospital, SMI Joist-Nevada (a structural metal fabricator), Day Zimmerman, Inc. (facilities support services), and Boeing Aerospace Operations (Nevada Department of Employment, Training, and Rehabilitation, 2001a). The five largest employers in Lyon County were the Lyon County School District, Amazon.com, Odyssey Business Services, Lyon County, and MSC Industrial Supply Company (an industrial machinery supplier) (Nevada Department of Employment, Training, and Rehabilitation, 2001b). The largest employers in Mineral County were Day Zimmerman-Hawthorne, Inc., Kennecott Rawhide Mining Company (gold ores), Mineral County, an amusement/recreation facility, and the Mineral County School District (Nevada Department of Employment, Training, and Rehabilitation, 2001c). The employers of the largest portion of the labor force in Washoe County were Washoe County School District, the University of Nevada at Reno, the Reno Hilton, the Washoe County Comptroller, the Silver Legacy Resort Casino, and a large number of additional resort casino and hotel facilities (Nevada Department of Employment, Training, and Rehabilitation, 2001d).

Table 3.7-2
Sector Employment

	Agriculture	Mining and Extractive Industries	Construction	Manufacturing	Transportation/ Communications/ Utilities	Wholesale and Retail Trade	Finance/ Insurance/ Real Estate	Services	Government	Total Employment
Churchill County										
1990	681	97	NA	295	268	1,618	456	NA	2,427	9,184
2000	659	60	757	709	NA	2,441	1,354	3,996	3,073	13,576
% Change	-3.2	-38.1	NA	140.3	NA	50.9	196.9	NA	26.6	47.8
Lyon County										
1990	629	193	669	1,289	397	1,253	415	1,853	987	7,831
2000	721	195	1,370	1,810	449	3,118	1,041	3,809	1,619	14,431
% Change	14.6%	1.0%	104.8%	40.4	13.1	148.8	150.8	105.6	64.0	84.3
Mineral County										
1990	41	643	82	30	49	356	66	1,380	643	3,213
2000	41	NA	78	NA	29	352	127	NA	NA	2,570
% Change	0.0%	NA	-4.9%	NA	-40.8	-1.1	92.4	NA	NA	-20
Washoe County										
1990	459	1,882	9,949	9,371	10,638	37,897	13,784	72,770	18,680	176,549
2000	689	953	17,607	14,870	13,664	50,548	24,212	93,459	22,617	240,785
% Change	50.1%	-49.4%	77.0	59	28.4	33.4	75.7	28	21.1	36.4

Sources: BEA 2001b
* Includes proprietors' income

Income and Earnings by Industry

Per capita personal income in 2000 in the project area was highest in Washoe County, at $34,879, an increase of 47.8 percent over the 1990 income of $23,595. For Mineral County in 2000 the per capita personal income was $25,378, an increase of 56.1 since 1990. Churchill and Lyon counties had the lowest per capita incomes, at $23,615 and $22,318 (BEA 2001a).

Earnings by persons employed in Churchill, Lyon, and Washoe counties increased by 105.2 percent, 129.8 percent, and 91.4 percent, respectively; while, total earnings in Mineral County declined by 1.7 percent (Table 3.7-3). In terms of earnings, the largest industries in 2000 in Churchill County were government and services (with $141.306 million and $104.459 million in earnings). In Lyon County services, manufacturing, and government had the highest earnings, with $67.214 million, $61.674 million, and $59.046 million in earnings, respectively. Services had the highest reported earnings in Mineral County, but mining and services, for which earnings were not available in 2000, reported the highest earnings in 1990. The highest earnings in Washoe County occurred in the services, trade, and government sectors, with $2,969,501,000, $1,414,932,000, and $80.757 million in earnings, respectively (BEA 2001a).

Finance/insurance/real estate experienced the highest growth between 1990 and 2000 in Churchill, Mineral, and Washoe counties (Table 3.7-3), and trade experienced the greatest growth in Lyon County. Earnings in mining declined in Churchill and Washoe counties between 1990 and 2000 (by 19.5 percent and 29.9 percent). In Mineral County earnings in both trade and transportation/communications/utilities decreased (by 9.2 percent and 7.2 percent) (BEA 2001a).

Housing

Table 3.7-4 shows housing occupancy type and vacancy for the project area counties in 1990 and 2000. Between 1990 and 2000 the total number of housing units in Churchill, Lyon, and Washoe counties increased, and Mineral County experienced a decrease in total housing units (-4.3 percent). Owner occupancy increased in all four of the project area counties. In 2000 Lyon County had the highest owner-occupancy rate (75.8 percent), and Washoe County had the lowest (59.3 percent). In 2000 Washoe County had the lowest vacancy rate (8.2 percent) but the largest number of vacant residences (11,824), and Mineral County had the highest vacancy rate (23.3 percent) but the least vacant housing units (669) (US Census 1990a, 2000c).

Schools

One school district serves Churchill County, with six elementary schools, a junior high school, a high school, a charter high school, and an alternative education school, with a total enrollment in the 1999-2000 school year of 4,860 students. The Lyon County School District is the only public school district for Lyon County, Nevada. Seven elementary schools, four middle schools, and four high schools served 6,539 students in the 1999-2000 school year. One school district serves Mineral County's 907 students. The district is composed of a primary school (pre-kindergarten through third grade),

Table 3.7-3
Earnings by Industry (in Thousands of Dollars)

	Agriculture	Mining and Extractive Industries	Construction	Manufacturing	Transportation / Communications / Utilities	Wholesale and Retail Trade	Finance / Insurance / Real Estate	Services	Government	Total Earnings
Churchill County										
1990	$11,436	$956	NA	$7,960	$9,147	$23,989	$5,689	NA	$75,325	$190,646
2000	NA	$770	$34,943	$21,539	NA	$44,921	$17,133	$104,459	$141,306	$391,278
% Change	NA	-19.5	NA	170.6	NA	87.3	201.2	NA	87.6	105.2
Lyon County										
1990	$16,933	$5,767	$16,840	$29,697	$11,972	$16,981	$4,258	$25,957	$25,972	$154,377
2000	$18,087	$8,002	$40,435	$61,674	$15,909	$71,236	$13,108	$67,214	$59,046	$354,711
% Change	6.8	38.8	140.1	107.7	32.9	319.5	207.8	158.9	127.3	129.8
Mineral County										
1990	$566	$27,408	$1,273	$567	$1,607	$4,704	$895	$22,779	$16,078	$75,877
2000	NA	NA	$1,598	NA	$1,491	$4,271	$1,870	NA	$20,762	$74,609
% Change	NA	NA	25.5	NA	-7.2	-9.2	108.9	NA	29.1	-1.7
Washoe County										
1990	$19,935	$68,577	$331,094	$277,545	$340,250	$753,558	$241,028	$1,738,904	$635,191	$4,406,082
2000	$49,907	$48,047	$763,538	$675,277	$603,810	$1,414,932	$741,483	$2,969,501	$1,164,634	$8,431,129
% Change	150.3	-29.9	130.6	143.3	77.5	87.8	207.6	70.8	83.4	91.4

Source: US Bureau of Economic Analysis 2001a

Table 3.7-4
Housing

	Churchill County	Lyon County	Mineral County	Washoe County
Total Units				
1990	7,290	8,722	2,994	112,193
2000	9,732	14,279	2,866	143,908
Percent Change	33.5%	63.7%	-4.3%	28.3%
Owner-Occupied[1]				
1990	63.1%	72.4%	66.5%	54.1%
2000	65.8%	75.8%	72.5%	59.3%
Vacancy				
1990	8.6%	11.9%	15.5%	8.8%
2000 (number)	8.4%	8.9%	23.3%	8.2%
	(820)	(1,272)	(669)	(11,824)

Source: US Census Bureau 1990a, 2000c

[1]Percent of units that are occupied by owner

two elementary schools, a middle school, a high school, and an alternative education center. The Washoe County School District had an enrollment of 54,508 students in its 58 elementary schools, 12 middle schools, 12 high schools, one vocational school, one special education center, three English-as-a-second-language schools, and two alternative education facilities (NCES 2002).

Environmental Justice

This section addresses specific topics related to environmental justice as required by the National Environmental Policy Act of 1969. Specifically, a discussion of issues related to environmental justice are presented in accordance with Executive Order 12898, and issues related to protection of children from environmental health risks are presented in accordance with Executive Order 13045.

On February 11, 1994, President Clinton issued Executive Order 12898, entitled "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." This order requires that "each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, on minority populations and low-income populations" (Executive Order 12898, 59 FR 7629 [Section 1-101]). The following studies have been conducted to comply with the order:

- Gathered economic, racial, and demographic information generated to identify areas of low-income and high minority populations in and around the project area and
- Assessed the alternatives for disproportionate impacts resulting from on-site activities associated with the proposed action.

The KGRAs and other leasing areas are in portions of Churchill, Lyon, Mineral, and Washoe counties. Racial and ethnic data for these areas for 1990 and 2000 have been compiled and are illustrated in Table 3.7-5. In 2000 only Mineral County had a minority racial population of greater than ten percent. (Approximately 79.0 percent of the population fell into the white/other racial category.) The Hispanic population formed one of the few ethnic groups within the four project area counties with a substantial population percentage (8.7, 11.0, 8.4, and 16.6 percent in Churchill, Lyon, Mineral, and Washoe counties, respectively). Mineral County experienced a decline in all population groups between 1990 and 2000, with the exception of the Native American group. This group increased by 4.1 percent during this period and made up approximately 15.4 percent of the county's population in 2000 (US Census 1990a, 2000d).

Table 3.7-5
Population Percentage by Race/Ethnicity

Race/Ethnicity	Churchill County	Lyon County	Mineral County	Washoe County
Total White & Other				
1990	91.3	95.8	81.9	92.0
2000	90.7	96.2	79.0	91.4
Percent Change	32.8	73.2	-24.5	32.4
Hispanic				
1990	5.6	7.6	8.4	9.0
2000	8.7	11.0	8.4	16.6
Percent Change	106.0	150.4	-21.6	145.2
Total African American				
1990	1.1	0.3	5.4	2.2
2000	1.6	0.7	4.8	2.1
Percent Change	88.7	240.9	-31.1	24.9
Total Native American, Eskimo, Aleut				
1990	5.0	3.1	11.6	1.9
2000	4.8	2.4	15.4	1.8
Percent Change	28.0	35.5	4.1	25.2
Total Asian and Pacific Islander				
1990	2.6	0.8	1.1	3.9
2000	2.9	0.7	0.9	4.7
Percent Change	50.9	61.6	-34.3	63.7

Source: U.S. Census 1990a, 2000d
Note: Percentages for a given area for a given year do not add to 100 because "Hispanic" is an ethnicity category, which includes all races.

The US Census Bureau uses a set of income thresholds that vary by family size and composition to determine which families are poor. If a family's total income is less than its threshold, then that family, and every individual in it, is considered poor. The poverty thresholds do not vary geographically, but they are updated annually for inflation using the Consumer Price Index. For example, in 2000 the average estimated poverty threshold for an individual was an annual income of $8,787, and for a four-person houshold it was $17,601 (Dalaker and Proctor 2000). The 1998 Census estimates

indicate that approximately 10.6 percent of the population of Churchill County, 11.6 percent of Lyon County, 16.6 percent of Mineral County, and 9.9 percent of Washoe County was below the poverty line in 1998. This represents a 26.7, 52.8, 4.5, and a 34.0 percent increase in the number of individuals below the poverty line in Churchill, Lyon, Mineral, and Washoe counties from 1990 levels (US Census Bureau 1990b and 2001).

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (Executive Order 13045, 62 FR 19885), states that each federal agency shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. Environmental health risks and safety risks mean risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or to ingest.

Approximately 28.9 percent of Churchill County, 27.1 percent of Lyon County, 24.4 percent of Mineral County, and 24.9 percent of Washoe County is made up of children (under 18 years of age). Within Reno, approximately 23.2 percent of the population was under 18 years of age in 2000 (US Census 2000b).

3.8 RECREATION

This section describes the regulations pertaining to recreation and the recreation opportunities in the region of influence for the proposed action. Federal, state, and county recreation areas are limited in the area proposed for geothermal leasing. For the purpose of analyzing environmental impacts from the proposed action to recreation, recreation opportunities on or adjacent to geothermal lease lands are addressed in this section and are described below.

Bureau of Land Management. BLM is entrusted with the multiple-use management of natural resources on public land, in accordance with FLPMA. As part of multiple use management under FLPMA, public land must be managed for outdoor recreation and natural, scenic, scientific, and historical values (BLM 2002b).

BLM land is used for a variety of uses, including recreation. General recreation activities on BLM-administered land include biking, camping, picnicking, hiking, and wildlife viewing (BLM 2002e). In addition to these and other general recreation activities, certain specific activities also take place there and require a permit. Special recreation permits (SRPs) authorize specified recreational uses of the public lands and related waters. They are issued as a means to manage visitor use and to protect natural and cultural resources. SRPs are also issued to provide a mechanism to accommodate commercial recreational uses. The following are the five types of permits that are issued (BLM 2002e):

- Commercial use, which is defined as "recreational use of public lands and related waters for business or financial gain. When any person, group, or organization makes or attempts to make a profit, receive money, amortize equipment, or obtain goods or services, as compensation from participants in recreational activities occurring on public lands, the use is considered commercial." Examples of activities requiring a commercial use permit include, jeep touring, offering horse trail and wagon train rides, making cattle drives, and taking recreational photographs.
- Competitive use, which is "any organized, sanctioned, or structured use, event, or activity on public land in which two or more contestants compete and either (1) participants register, enter, or complete an application for the event, or (2) a predetermined course or area is designated." Examples of activities requiring a competitive use permit include off-highway vehicle (OHV) racing, horse endurance riding, mountain bike racing, and activities associated with rodeos.
- Vending, which are "temporary, short-term, non-exclusive, revocable authorizations to sell goods or services on public lands in conjunction with a recreation activity." Examples of activities requiring vendor permits include selling T-shirt in conjunction with a raft race, selling hot dogs at a motorcross event, selling firewood in a BLM campground, and offering shuttle services.

- Special area use, which are "areas officially designated by statute or Secretarial order." Examples of special areas in Nevada include the Red Rock Canyon National Conservation Area and the Black Rock Desert/High Rock Canyon Emigrant Trails National Conservation Area.
- Organized group activity and event use permits are for "noncommercial and noncompetitive group activities and recreation events." Examples of activities requiring an organized group activity and event use permit include a large scout campout, a fraternity activity, a large family reunion, or a dual sport event.

Objectives of the BLM recreation permitting system are to satisfy recreational demand within allowable use levels in an equitable, safe, and enjoyable manner. This also includes minimizing adverse resource impacts and user conflicts.

National Park Service. The National Park Service administers natural areas, historical areas, and recreational areas. Under the National Park Service Organic Act of 1916, it promotes and regulates the use of national parks and is to provide for the enjoyment of natural and historic objects and wildlife in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations (National Park Service 2002b).

US Forest Service. Congress has directed the USFS to "manage national forests for additional multiple uses and benefits and for the sustained yield of renewable resources, such as water, forage, wildlife, wood, and recreation." Multiple use includes managing resources under the best combination of uses to benefit the public, while protecting the quality of the environment and ensuring the productivity of the land (USFS 2002b). The USFS manages recreation opportunities on national forests in order to provide for the recreational enjoyment of public.

Steamboat KGRA and Noncompetitive Lease Area

The Steamboat KGRA and noncompetitive lease area are between Carson City and Reno. There are no national or state parks in the area of the geothermal leasing lands (National Park Service 2002a; Nevada Division of State Parks 2002). The closest park is the 15-acre Virginia Foothills Park, which is a Washoe County community park, approximately 0.75 mile north of Section 34 in the Steamboat KGRA, next to Brown Elementary School. Recreation facilities include tennis and volleyball courts, covered group picnic areas, horseshoe pits, children's playground areas, a fitness trail, and a baseball/soccer field (Washoe County 2002).

Sections of the Steamboat KGRA and noncompetitive lease area are on the Humboldt-Toiyabe National Forest in the Carson Ranger District. Recreation associated with the creeks, streams, and unimproved roads on these sections can include hiking, bird watching, nature photography, and mountain biking (USFS 2002a).

Typical casual/dispersed uses in these lease areas include day hiking, nature study, walking , OHV riding, and horseback riding (Callan 2002b).

Hazen KGRA and Noncompetitive Lease Area

The Hazen KGRA and noncompetitive lease area are in Lyon County east of Fernley. There are no national or state parks in the area of the geothermal leasing lands (National Park Service 2002a; Nevada Division of State Parks 2002). The closest recreation opportunities are found at the Fernley State Wildlife Management Area, which the geothermal lease areas overlap. Recreation associated with the Fernley State Wildlife Management Area includes bird watching, nature photography, all-terrain vehicle driving, and some hunting (Bull 2002). Typical casual/dispersed uses in these lease areas include four-wheeling for pleasure, birdhunting, and OHV and horse riding. One BLM permitted event in this area is a horseback riding and buggy driving endurance ride (Callan 2002b).

Soda Lake KGRA and Noncompetitive Lease Area

The Soda Lake KGRA and noncompetitive lease area are in Churchill County. There are no national or state parks in the area of the geothermal leasing lands (National Park Service 2002a; Nevada Division of State Parks 2002). County park and recreation areas are within the city of Fallon and near Sheckler and Harmon reservoirs (Wright 2002). Typical casual/dispersed uses in these lease areas include bird and deer hunting, four-wheeling for pleasure, fishing, and birdwatching (Callan 2002b).

Stillwater KGRA and Noncompetitive Lease Area

The Stillwater KGRA overlaps with the Stillwater NWR and is adjacent to the Stillwater WMA. Recreation associated with the Stillwater area includes bird watching, fishing, and hunting (Churchill County 1990). Typical casual/dispersed uses in these lease areas include bird and deer hunting, four-wheeling for pleasure, fishing, and birdwatching (Callan 2002b).

There are no national or state parks in the area of the geothermal leasing lands (National Park Service 2002a; Nevada Division of State Parks 2002). County park and recreation areas are within the city of Fallon and near Sheckler and Harmon reservoirs (Wright 2002).

Salt Wells KGRA and Noncompetitive Lease Area

The Salt Wells KGRA is east of Carson Lake, and the Salt Wells noncompetitive lease area is on the eastern third of both Carson Lake and Carson Lake Pastures, as well as east of the lake. Components of the National Park System in the Salt Wells KGRA and noncompetitive lease area include the California Historic Trail and Pony Express National Historic Trail (National Park Service 2002a). In these geothermal lease areas, the Pony Express National Historic Trail cuts across the southern portion of the Salt Wells noncompetitive lease area. Recreation associated with these trails includes retracing pioneer routes and visiting historic monuments. The Pony Express National Historic Trail crosses the following geothermal lease areas (BLM undated):

- 17N 31E Section 31;
- 17N 31E Section 32;
- 16N 31E Section 6;
- 16N 30E Section 1;
- 16N 30E Section 2;
- 16N 30E Section 3;
- 16N 30E Section 4;
- 16N 30E Section 9; and
- 16N 30E Section 10.

Grimes Point is on the north side of US Highway 50, in the northern portion of the Salt Wells noncompetitive lease area and is administered by the CCFO of the BLM. Grimes Point is a popular area for hiking, picnicking, visiting Hidden Cave, and viewing petroglyphs (prehistoric rock art) (Nevada BLM 2002b). Grimes Point is on the geothermal lease areas 18N 30E, sections 20, 28, and 29 (BLM undated). There is an annual mountain bike race in April/May in this area (Callan 2002b).

Typical casual/dispersed uses in the Salt Wells KGRA/Russell Pass Areas include four-wheeling for pleasure. Every year, several BLM permitted OHV races pass through these areas, including the Valley Off-Road Racing Association in July, Best In The Desert in September, Horse Endurance Ride in October, and Pony Express Re-Ride in June. There are no state parks in the area of the geothermal leasing lands (Nevada Division of State Parks 2002). County park and recreation areas are within the city of Fallon and near Sheckler and Harmon reservoirs (Wright 2002).

Lee Hot Springs Noncompetitive Lease Area

The Lee Hot Springs noncompetitive lease area is south of Carson Lake and north of the Walker River Indian Reservation. A component of the National Park System in the Lee Hot Springs noncompetitive lease area is the Pony Express National Historic Trail (National Park Service 2002a). The trail is between Carson Lake and the geothermal lease area. Recreation associated with this trail includes retracing pioneer routes and visiting historic monuments. The Lee Hot Springs noncompetitive lease areas closest to the Pony Express National Historic Trail are 16N 29E, sections 19, 20, 21, 22, and 23.

There are no state parks in the area of the geothermal leasing lands (Nevada Division of State Parks 2002). County park and recreation areas are within the city of Fallon and near Sheckler and Harmon reservoirs (Wright 2002).

Aurora Crater Noncompetitive Lease Area

The Aurora Crater noncompetitive lease area is on the edge of the Humboldt-Toiyabe National Forest in the Bridgeport Ranger District. Springs and unimproved roads crisscross most of the lease area (USFS 2002a). Recreation associated with springs and unimproved roads in this area can include hiking, bird watching, nature photography,

mountain biking, and off highway vehicle driving. There are no national or state parks in the area of the geothermal leasing lands (National Park Service 2002a; Nevada Division of State Parks 2002).

Typical casual/dispersed uses in this lease area include bird and deer hunting, four-wheeling for pleasure, rockhounding, and ghost town exploring (Callan 2002b). The 2003 Vegas to Reno OHV race may come through this area. BLM permitted events include a dual sport motorcycle ride in June and buggy (OHV) rallies in August and September.

Wabuska Noncompetitive Lease Area

The Wabuska noncompetitive lease area is just north of Mason Valley Wildlife Management Area and west of the Walker River Indian Reservation. Components of the National Park System in the Wabuska noncompetitive lease area include the California Historic Trail (Sonora Route). The trail is just west of the lease area, and the closest Wabuska noncompetitive lease area to the California Historic Trail (Sonora Route) is 15N 25E, section 17 (BLM undated). Recreation associated with this trail includes retracing pioneer routes and visiting historic monuments. Also, the Mason Valley Wildlife Management Area is very popular with the public and includes recreation opportunities such as hunting, fishing, bird watching, nature photography, and hiking (Bull 2002).

Typical casual/dispersed uses in this lease area include four-wheeling for pleasure, OHV riding, birdwatching, and hunting (Callan 2002b). There are no state parks in the area of the geothermal leasing lands (Nevada Division of State Parks 2002).

3.9 GRAZING RESOURCES

The BLM manages livestock grazing in allotments within the district. This section describes grazing resources and regulations in the region of influence for the proposed action. The region of influence for grazing resources is the allotments within proposed geothermal lease areas.

The BLM manages grazing under the authority of the Taylor Grazing Act of 1934, FLPMA (1976), and the Public Rangelands Improvement Act of 1978. Under this management, ranchers may obtain permits for an allotment of public land on which a specified number of livestock may graze. The number of permitted livestock on a particular allotment is determined by how many animal unit months (AUMs) that land will support. The BLM operates a program to stabilize or improve the ecological condition of the allotments. This program includes proper management of livestock grazing and such improvements as fences and water developments.

Steamboat KGRA and Noncompetitive Lease Area

This lease area overlaps approximately 1,773 acres of the Jumbo Grazing Allotment, which is allocated to two permittees who are entitled to a total of 1,395 AUMs (sheep and cattle) between May and the end of August.

Hazen KGRA and Noncompetitive Lease Area

This lease area overlaps approximately 587 acres of the Truckee-Virginia Grazing Allotment, which supports 1,005 AUMs between November and April.

The lease area also overlaps with approximately 3,840 acres (400 AUMs) of the Bureau of Reclamation (BOR) grazing allotment within the Fernley Wildlife Management Area.

Soda Lake KGRA and Noncompetitive Lease Area

There are no BLM grazing allotments within or near this lease area. but the lease area does overlaps with approximately 15,000 acres of BOR grazing allotments. AUMs are not calculated for these allotments, and only two of the smaller permits include limits on the livestock.

Stillwater KGRA

There are no grazing allotments within or near this lease area.

Salt Wells KGRA and Noncompetitive Lease Area

This lease area overlaps three separate grazing allotments: Bass Flat, Rock Spring, and Salt Wells. The lease area overlaps approximately 6,128 acres of the Bass Flat allotment (supporting 1,598 AUMs), approximately 14,558 acres of the Rock Springs allotment (supporting 535 AUMs), and approximately 1,018 acres of the Salt Wells allotment (supporting 1,940 AUMs). Permits for these three allotments allow grazing between November and April.

This lease area also overlaps with approximately 1,300 acres of six BOR grazing allotments. AUMs are not calculated for these allotments, and five of the permits include limits on the livestock.

Lee Hot Springs Noncompetitive Lease Area

This lease area overlaps the Bass Flat and Horse Mountain grazing allotments. The lease area overlaps approximately 1,071 acres of the Bass Flat allotment, supporting 1,598 AUMs, and approximately 13,471 acres of the Horse Mountain allotment, supporting 3,000 AUMs. Grazing is permitted on the Bass Flat allotment between November and April and on the Horse Mountain allotment between January and March.

Aurora Crater Noncompetitive Lease Area

This lease area overlaps approximately 1,898 acres of BLM's Nine Mile Grazing Allotment, which supports 2,290 AUMs, and grazing is permitted in October, November, April, and May.

This lease area also overlaps with 642 acres of the USFS's Nine Mile allotment, one acre of the USFS's Powell Mountain allotment, and 1,129 acres of the Aurora allotment. The permitted use for the Nine Mile allotment is 1,076 cows with calves from April 1 to May 31 and 102 cows with calves from October 1 to November 30; the permitted use for the Powell Mountain allotment is 151 cows with calves from June 1 to October 15; and the permitted use for the Aurora allotment is 3,216 ewes with lambs from June 1 to September 1. (The Aurora allotment is vacant at this time.) The USFS grazing allotments are not calculated in terms of AUMs.

Wabuska Noncompetitive Lease Area

This lease area overlaps approximately 6,407 acres of the Adriance Valley Grazing Allotment, which supports 1,620 AUMs year-round.

3.10 WILDERNESS STUDY AREAS

This section describes the regulations pertaining to WSAs and the setting in the region of influence for the proposed action. A WSA is a unit of BLM-administered land whose characteristics meet criteria for wilderness. Guidelines for consideration as wilderness include size (greater than 5,000 acres), naturalness or absence of improvements, such as roads or power lines, and opportunities for solitude or primitive unconfined recreation (BLM 1992). Additionally, WSAs often are characterized by special qualities, such as ecological, geological, educational, historical, scientific, or scenic values. At present, there are approximately 5.1 million acres in 110 WSAs in Nevada (Nevada BLM 2002d). For the purpose of analyzing environmental impacts from the proposed action to WSAs, WSAs within 20 miles of geothermal lease lands that the CCFO administers are addressed in this section and are described below.

Under FLPMA, BLM is required to review the lands it manages, determine which areas have potential as wilderness, and report to Congress. In 1991, Nevada BLM completed a Wilderness Study Report, which contained recommendations for wilderness and nonwilderness in each of the WSAs at the time. All WSAs are managed under the Interim Management Policy and Guidelines for Lands Under Wilderness Review until Congress either designates a WSA as a new addition to the National Wilderness Preservation System or releases it for uses other than wilderness (BLM 1992).

The CCFO manages six WSAs in Nevada (BLM 2001b), which are in the northeast, southeast, and southwest areas of the Carson City District. When compared to project location maps, two of the WSAs, Job Peak WSA (NV-030-127) and Stillwater Range WSA (NV-030-104), are identified as being near geothermal lease lands that the CCFO administers (BLM 1992). These WSAs are near the Stillwater KGRA.

Stillwater KGRA

The western boundary of the Job Peak WSA is approximately two to three miles east of the Stillwater KGRA and covers 90,209 acres. The eastern side of the main ridgeline in the study area is in an essentially natural condition. The remainder of the study area is more heavily affected by human activity, evidenced by the presence of roads, pipelines, fences, borrow pits, a small area of historic mining, and spring developments. Because the size of the area is conducive to isolation but the topographic and vegetative screening is poor, opportunities for solitude vary. Also, the Naval Air Station Fallon conducts air warfare training over the study area. Hiking and camping opportunities are clustered in the northeast portion of the study area (BLM 2000). Although the Job Peak WSA is not recommended for wilderness, it is still under the protection of BLM.

The southwestern boundary of the Stillwater Range WSA is approximately 12 to 13 miles northeast of the Stillwater KGRA and covers 94,607 acres. The central mountainous portion of the study area is in an essentially natural condition, and the surrounding areas are more heavily affected by human activity. Evidence of human activity includes roads for mining, fences, and both old and grandfathered mining operations. Opportunities for solitude vary, and there are few points of interest to attract a visitor. Also, Naval Air Station Fallon conducts air warfare training over the study area (BLM 2000). Although the Stillwater Range WSA is not recommended for wilderness, it is still under the protection of BLM.

3.11 AIR QUALITY

Ambient Air Quality Standards

The federal government has established ambient air quality standards for criteria pollutants, including ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), fine and inhalable particulate matter ($PM_{2.5}$ and PM_{10}), and lead particles. With the exception of the SO_2 standard, the Nevada Division of Environmental Protection (NDEP), Bureau of Air Quality has adopted the federal standards to regulate air pollution in the state. NDEP has adopted an SO_2 standard more stringent than the federal standards.

Existing Air Quality Conditions

Nevada is mandated to identify geographic areas that do not meet federal and state air quality standards. The state uses air quality data gathered by monitoring networks to determine the areas within the state not attaining standards. Areas that violate federal or state standards are referred to as "nonattainment areas" for the relevant pollutants. Washoe County is an ozone nonattainment area; the Reno-Sparks area of the county is also a CO and PM_{10} nonattainment area (40 CFR Part 81). Two parcels evaluated in this document are within the ozone nonattainment area boundaries, and another two parcels are within the ozone, CO, and PM_{10} nonattainment area boundaries. There are no nonattainment designations for the rest of the state, including Churchill, Mineral, and Lyon counties. The remainder of the proposed parcels are within these counties.

Conformity Requirements

Section 176(c) of the CAA, USC § 7506(c), requires federal agencies to ensure that actions undertaken in nonattainment areas are consistent with the Clean Air Act and with federally enforceable air quality management plans. EPA has promulgated separate rules that establish conformity analysis procedures for transportation-related actions and for other (general) federal agency actions. The EPA general conformity rule applies to federal actions occurring in nonattainment areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emission thresholds that trigger requirements of the conformity rule are called de minimis levels. The applicable de minimis levels for actions undertaken in all or part of Washoe County are 100 tons per year of carbon monoxide, 70 tons per year of PM_{10}, and 100 tons per year of ozone precursor emissions (NOx and ROG).

3.12 WILD HORSES AND BURROS

This section describes the regulations that protect wild horses and burros on public land and the setting of the herd management areas (HMAs) in the region of influence for the proposed action. BLM manages wild horses and burros in HMAs, and there are approximately 103 HMAs in Nevada. In addition to HMAs for horses, the Marietta Wild Burro Range (NV316) southeast of Hawthorne, is the nation's only formally recognized wild burro range. It was dedicated in 1991, contains approximately 85 burros, and covers 68,000 acres (BLM 2002c). For the purpose of analyzing environmental impacts from the proposed action to wild horses and burros in HMAs, HMAs within 10 miles of geothermal lease lands that the CCFO administers are addressed in this section and are described below.

The primary responsibilities of the BLM under the Wild Free-Roaming Horse and Burro Act of 1971 are to preserve and protect wild horses and burros and to manage for healthy rangelands (BLM 2002a). Under the act, BLM was directed to identify herd areas where horses and burros were located. BLM inventoried and mapped these herd areas in the first few years following passage of the act. Through BLM's planning process, the areas where horses can be managed, called HMAs, as a component of the public lands are designated (BLM 2002c).

The CCFO manages 15 HMAs, and all but one of the HMAs, the Marietta Wild Burro Range, is for horses (BLM 2001b). The HMAs are scattered throughout the district. When compared to project location maps, the Lahontan HMA (NV306) is identified as being near the proposed geothermal lease areas (BLM 2001b).

Wabuska Noncompetitive Lease Area

The Lahontan HMA is approximately 35 miles east of Carson City, immediately south of the Lahontan Reservoir, and approximately six miles north of the Wabuska noncompetitive lease area. It covers 11,000 acres and is at an elevation of approximately 4,167 feet. The HMA is flat with low sandy deposits and alkali flats, and wild horses are usually found outside the HMA east of the reservoir and south of the Lahontan Reservoir Narrows. The appropriate management level for the HMA is seven to ten horses because of the small size of the area; however, the current population is over 100 animals, most of which are outside of the HMA. The HMA also is habitat for many reptiles, small mammals, coyotes, and a few birds (BLM 2002a).

3.13 HAZARDOUS MATERIALS

This section describes the regulations pertaining to hazardous materials and the setting in the region of influence for the proposed action. For the purpose of analyzing environmental impacts from the proposed action, hazardous materials on geothermal leases, adjacent to geothermal leases, or associated with geothermal leases are addressed in this section and are described below.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal fund to clean up uncontrolled or abandoned hazardous-waste sites and certain other releases of pollutants and contaminants into the environment. Section 120(h) of CERCLA requires that property contaminated by the federal government be restored before being conveyed outside the federal government (USEPA 2002).

The Resource Conservation and Recovery Act (RCRA) gave EPA the authority to control hazardous waste from when it was created to its disposal and includes the generation, transportation, treatment, storage, and disposal of hazardous waste. Drilling fluids, produced water, and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy are exempt from RCRA Subtitle C (USEPA 1993).

The federal lands proposed for leasing are undeveloped and no hazardous materials are suspected to be present at any of the leasing locations. No evidence was found to indicate that any hazardous material was stored for one year or more or disposed of or released on any of the geothermal lease areas.

4. ENVIRONMENTAL CONSEQUENCES

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

Introduction

This chapter describes the potential environmental consequences of the proposed action and the No Action Alternative. CEQ regulations implementing the procedural provisions of NEPA (40 CFR 1500–1508) defines three types of impacts from a proposed action to be considered in the environmental analysis: Direct, indirect, and cumulative. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action but take place later in time or farther removed in distance but are still reasonably foreseeable. Cumulative effects result from the incremental impact of the proposed action added to other past, present, and reasonably foreseeable actions.

As described in Chapter 1, the proposed action considered in this EA—issuing leases for geothermal resources—is considered a federal action and a commitment to resource development and therefore requires NEPA analysis. While issuing a lease for geothermal resources confers on the lessee the right to future exploration and development of geothermal resources within the lease area, issuing a lease does not confer on the lessee the right to explore for or develop geothermal resources if such activities would extend beyond the level of casual use. As a result, there would be no direct impacts resulting from the proposed issuance of geothermal leases.

Nevertheless, it is reasonably anticipated that issuing a lease would result in subsequent exploration, development, production, and closeout activities by the lessee. Such subsequent activities could result in indirect impacts. For the purposes of this EA, assumptions regarding these subsequent actions are described in a reasonable development scenario (Appendix C).

The potential environmental impact of the proposed leasing action depends on a number of factors in the reasonable development scenario. These factors include the type and extent of the geothermal deposits, the probable sequence and success or failure of the various phases (i.e., exploration, development, production, and closeout

after abandonment or production ceases), the proportion of government to private land ownership, and the biological, physical, and demographic characteristics of the local area involved.

Because there is limited knowledge concerning the occurrence, location, and suitability for developing geothermal resources in the area proposed for leasing, it is not possible to quantify the number of facilities that may eventually be built on the leased areas nor to identify their specific location. These uncertainties make it difficult to accurately predict environmental impacts. As a result of these uncertainties, environmental impact analysis must be somewhat generalized and conceptual at the leasing stage. Specific impacts and associated mitigation measures of subsequent activities would be addressed in the required post-leasing analysis and approval process when details of such activities are known.

The impact analysis is organized in order of the resource areas described in Chapter 3. As described above, the proposed leasing project would not result in direct impacts on the physical or human environment, but the potential for significant indirect impacts as a result of subsequent geothermal exploration and development activities must also be assessed. Because of the large potential lease area and the lack of specific locations for subsequent geothermal development activities, potential impacts cannot be accurately characterized. As a result, the potential for significant impacts for each resource in each lease area is characterized as being of high, medium, or low risk. The determination of environmental risk is resource-specific and is based on a number of factors, including the presence and extent of resources within a proposed lease section, the extent of resources in the surrounding area, and the quality of existing data.

In addition to complying with its Geothermal Resources Leasing and Operations rules, BLM may further require geothermal leasing and development to reduce the effects on the human and natural environment. Standard operating procedures (SOPs) outlined in the CCFO CRMP provide the general parameters of environmental controls for leasing (see Appendix D). SOPs provide for the development and inclusion of subsequent restrictions, including conditions of approval (COAs) (see Appendix D). COAs are measures that may be required of the lessee as part any BLM's environmental review or permit approval for ground-disturbing activities related to geothermal exploration, development, operation, or closeout. Standard lease stipulations may also be required to address any additional concerns. Standard lease stipulations that would be required for all leases approved as part of the proposed action were developed to address any additional concerns (see Appendix D). Because the proposed action is leasing and because impacts would occur only during subsequent exploration and development, it is assumed that these mitigating measures would be in place during subsequent development activities and are therefore included in determining the risk of potentially significant environmental impacts. The environmental risk for each section of land proposed for competitive or noncompetitive leasing is summarized in Table 4-1 at the end of this chapter.

As described in Chapter 1, 57 noncompetitive lease applications were submitted to BLM by May 1, 2002, but 15 of these applications were for sections of land for which BLM has no leasing authority, and they are not considered further in this EA (Appendix A contains a list of all noncompetitive lease application areas, including those that have are not considered). Included in the lease applications not considered were applications for lands in southern Washoe County around the Steamboat KGRA, where, as described above, BLM is precluded from leasing by the Southern Washoe County Urban Interface Plan Amendment. In addition, lands within the KGRA that are already leased or that are inconsistent with the BLMs leasing authority cannot be offered for leasing and are not evaluated in this EA.

4.1 LAND USE

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to land use in the proposed lease areas. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of the Proposed Action

The leasing of land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction. Therefore, there would be no direct impact on land use.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting land use is assessed with respect to two significance criteria. Potential impacts on land use could occur if reasonably foreseeable future actions were to:

- Conflict with multiple use management of lands administered by the BLM (CCFO) or USFS (Humboldt-Toiyabe National Forest); or
- Result in proposed uses that are incompatible with existing or adjacent land uses.

The potential risk assessment of indirect impacts affecting land use from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future

indirect impacts on land use in the region of influence. The assessment is described below and is summarized in Table 4-1.

As described in Section 3.1 although all lease areas may contain existing valid surface uses (i.e., easements, rights-of-way, range improvements, etc.), it is assumed that these uses are largely nonexclusive and therefore compatible rights can be granted. The overall risk of land use impacts from such uses is, therefore, assumed to be a low. Exceptions to this are noted below for specific lease areas. Standard lease stipulations in Appendix E specify that all leasing activities are subject to these existing rights.

Steamboat KGRA and Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM or USFS, and land sections proposed for leasing are consistent with the direction contained in the Southern Washoe County Urban Interface Plan Amendment.

Although all proposed changes in land use would occur on land administered by either the BLM or USFS, Senate Bill 40 requires that actions on BLM land be evaluated for consistency with county policy plans for public lands. Leasing activities on public lands designated as open would be consistent with the policies of Washoe County. Due to the highly urbanized nature of the Steamboat area, depending on the exact location of future geothermal development, potential conflicts with existing or planned urban and open space land uses in the surrounding area could occur. Impacts may be mitigable through BLM and county site approvals. Leasing and potential future geothermal development of split estate lands in the Steamboat area (Section 34 T18N R20E, Section 6 T17N R20E, and Section 36 T18N R19E) would be incompatible with private surface uses.

The risk for potentially significant impacts to land use would be high for all land sections in the Steamboat area.

Hazen KGRA and Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM. Reclamation has concurred that development of geothermal resources in this area would not conflict with its management objectives for withdrawn lands in the area.

Sections 2, 10, 12, and 14 T20N R25E and sections 6 and 18 T20N R26E proposed for leasing are on Reclamation land that NDOW manages as part of the Fernley State WMA. While the federal government has retained the right to lease these lands, geothermal leasing would be incompatible with NDOW's wildlife management objectives for these lands. Although geothermal development would occur only on public lands, such development could be inconsistent with the preferred agricultural, recreation, and environmental uses Churchill County has established for surrounding open lands.

The risk for potentially significant impacts to land use would be high for sections that are part of the Fernley State WMA (T20N R25E sections 2, 10, 12, and 14 and T20N 26E sections 6 and 18) and would be low for all other sections.

Soda Lake KGRA and Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM. Reclamation has concurred that developing geothermal resources in this area would not conflict with its management objectives for withdrawn lands in the area. Similar to the Hazen area, geothermal leasing on any of the sections proposed in the Soda Lake area could be inconsistent with the designated uses of surrounding open lands contained in the Churchill County Master Plan.

The risk for potentially significant impacts to land use would be low.

Stillwater KGRA

Geothermal development in this area would not conflict with multiple use management objectives of the BLM. Reclamation has concurred that development of geothermal resources in this area would not conflict with its management objectives for withdrawn lands in the area. Several sections proposed for leasing would be adjacent to Stillwater WMA (T19N R30E sections 25 and 36). Section 35 T20N R30E is adjacent to the Fallon Indian Reservation. Leasing in the Stillwater area would be consistent with the designated uses of public land by the Churchill County Master Plan.

Overall, the risk for potentially significant impacts on land use would be medium for sections adjacent to the Stillwater WMA (T19N R30E sections 25 and 36) and low for all other sections.

Salt Wells KGRA and Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM. Reclamation has concurred that development of geothermal resources in this area would not conflict with its management objectives for withdrawn lands in the area. Several areas proposed for leasing include portions of the Grimes Point Archaeological Area (T18N R30E sections 20 and 29) and Carson Lake Pastures area (T17N R30E sections 5, 8, 17, 20, 29, and 32). While leasing is prohibited in the Grimes Point Archaeological Area and the Carson Lake Pastures, the federal government has retained the right to lease portions of land outside this area. Nevertheless, leasing the remaining land within these sections could result in development that is incompatible with adjacent sensitive land uses in both these areas.

Sections 19 and 30 T18N R30E are in Navy withdrawn lands adjacent to NAS Fallon. Geothermal development in these sections is height restricted and may be somewhat inconsistent with surrounding military land uses.

Although geothermal development in the Salt Wells area could be inconsistent with the designated uses for the surrounding lands, as contained in the Churchill County Master

Plan, almost no private land subject to these use designations is found around the lease area.

The risk for potentially significant impacts on land use would be medium for sections that include the Grimes Point Archaeological Area (T18N R30E sections 20 and 29), sections that include the Carson Lake Pastures (T17N R30E sections 5, 8, 17, 20, 29, and 32), and sections that are on Navy withdrawn land (T18N R30E sections 19 and 30), and low for all remaining sections.

Lee Hot Springs Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM. Sections 20 and 21 T16N R29E are designated for disposal in the CCFO CRMP for use by the city of Fallon as a landfill. Geothermal development in these sections may be precluded by this land use.

Proposed lease sections 4, 9, 16 and 21 T15N R29E are on Navy withdrawn lands adjacent to the B-19 training range. Geothermal development in these sections is height restricted and may be somewhat inconsistent with surrounding military land uses.

Although geothermal development in the Lee Hot Springs area could be inconsistent with the designated uses for the surrounding lands, as contained in the Churchill County Master Plan, almost no private land subject to these use designations is found around the lease area.

The risk for potentially significant impacts to land use would be high for sections designated for disposal for the Fallon landfill (sections 20 and 21 T16N R29E), medium for sections that are on Navy withdrawn land (sections 4, 9, 16 and 21 T15N R29E), and low for all remaining sections.

Aurora Crater Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM. USFS has concurred that developing geothermal resources in this area would not conflict with its management objectives for the area. Geothermal development would be compatible with existing mining operations in proposed lease sections (T5N R28E section 16). Geothermal development could also be consistent with the policies for development of surrounding open lands, as contained in the Mineral County Master Plan. The risk for potentially significant impacts to land use would be low for all sections.

Wabuska Noncompetitive Lease Area

Geothermal development in this area would not conflict with multiple use management objectives of the BLM and would be consistent with the policies for development of surrounding open lands, as contained in the Lyon County Master Plan. The risk for potentially significant impacts to land use would be low for all sections.

4.2 SOILS, GEOLOGY, AND MINERALS

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to soils, geology, or mineral resources. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of Proposed Action

Leasing land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction. Therefore, there would be no direct impact on soils, geology, or minerals.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting soils, geology, or minerals is assessed with respect to five significance criteria. Potential impacts on these resources could occur if reasonably foreseeable future actions:

- Were located on or near the trace of a known active fault or an area characterized by surface rupture that might be related to a fault;
- Were to increase the potential for human injury or economic loss from earthquakes, liquefaction, slope failure, or other geologic hazards;
- Were to reduce or prevent exploration or recovery of important economic mineral resources;
- Were to result in a substantial reduction in important farmland or loss of soil that supports important habitat, or if they were to sufficiently erode terrain to render it unsuitable for existing uses; or
- Were to damage or degrade an important geologic feature or landmark.

The potential risk assessment of indirect impacts affecting soils, geology, or minerals from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts on soils, geology, or minerals in the region of influence. The assessment is described below and is summarized in Table 4-1.

All Proposed Lease Areas

Soils. Soils in most of the geothermal lease areas are either rocky or alkaline or have other limitations that make them unsuitable as farmland. However, in some areas there are some soils that, if properly managed or reclaimed, could be productive farmlands. In other areas, the soils are mainly used to support wildlife habitat. Geothermal development could reduce the potential for future use of soils as farmland, but in most areas lack of irrigation water already limits agricultural development. If necessary, geothermal facilities can be designed to minimize encroachment on farmland or potential farmland.

Constructing roads and geothermal facilities requires disturbing soils and land cover. In many of the geothermal lease areas, the land is sparsely vegetated and surface soils are "armored" with a layer of pebbles and gravel called "desert pavement," which has resulted from years of wind erosion winnowing the soils. The desert pavement stabilizes the surface soil, and when disturbed the soil becomes more vulnerable to erosion. The chemistry and properties of surface soils may be much different than the subsurface soils at shallow depth. With little rainfall, desert soils tend to develop and evolve over long periods so that scars from soil disturbance may remain for many years. These characteristics of desert soils can lead to slow recovery vegetation in disturbed areas. In general, soil disturbance can be minimized through the use of best management practices. Future environmental studies may be required to identify mitigation options appropriate for specific sites where these impacts could occur. Such studies and mitigation measures are typically identified when grading and building permit applications are filed.

Seismicity. In general, two types of seismic impacts are possible; one results from ground shaking in a large earthquake, which could damage geothermal structures; the other can be caused by the operating a geothermal plant, including fluid injection or withdrawal, which could trigger earthquakes.

Geothermal resources tend to occur in areas of geologically recent volcanic activity. Often these areas contain active faults, and often geothermal fluids circulate from deep to shallow depths because of fault-related fracturing. Also, some faults that may be distant from the geothermal area may produce earthquakes large enough to cause severe ground shaking in the project area. Seismic hazards from ground shaking or liquefaction are typically identified and designed on a site-specific and facility-specific basis, and building plans are reviewed for conformance with building codes before construction begins. Therefore, although seismic hazards may exist at a site, the engineering design should reduce the level of hazard to less than significant levels.

Injecting fluids into fractured rock in an active fault zone increases the pore pressure in the rocks and theoretically can trigger earthquakes on an existing prestressed fault. However, the excess pore pressure created by geothermal fluid injection is typically much less than the pressure needed to stimulate movement on a fault (Chevron Resources Company 1987). Past experience with geothermal energy production facilities suggests that operating the facilities is unlikely to induce strong earthquakes, although it

may cause minor detectable increases in seismicity. Therefore, the significance of the potential increase in seismicity associated with operation of geothermal facilities is considered less than significant.

Mineral Resources. Geothermal areas are sometimes also areas of hydrothermal mineral deposition. Heated groundwater circulating through fractured rock dissolves metals from the rock and redeposits them in the fractures, which over long periods can create significant ore deposits. Areas where these hydrothermal mineral encrustations are visible in rocks near the surface are often good mineral prospecting sites. In some areas, geothermal fluids themselves may contain high concentrations of dissolved salts of economic mineral, which may be recoverable along with the geothermal heat energy. Often, the dissolved salts precipitate as the water is brought to the surface, due to cooling, reduction in pressure, and other changes in chemical characteristics of the water. The precipitation of these salts in pipes represents an engineering problem for geothermal plants. Thus, the economics of geothermal development could be influenced by the mineral content of the geothermal fluids.

Both geothermal development and mining could be conducted in the same general area. The extent of their compatibility would depend on the nature of the mining operation and of the geothermal development. For example, pit mining or quarrying operations could interfere with siting more permanent geothermal facilities (wells, pipelines, power generating plants). Thus, geothermal development of an area could restrict the ability to extract minerals.

Steamboat KGRA and Noncompetitive Lease Area

Soils. Most of the soils in the lease area are shallow and rocky and on moderate to steep slopes. Although potential for erosion is high, the low precipitation and runoff in the area reduces the potential for significant soil erosion. Soils in the flatlands of Pleasant Valley, such as in the northwest corner of Section 8 are considered to be prime farmland. Therefore, placing geothermal facilities on these lands could affect agricultural use of the soils. Due to the relatively small size of geothermal facilities, the amount of productive soils lost is not expected to be significant. There is a low potential risk for impacts on soils from future geothermal activities.

Seismicity. As discussed in Section 3, the Steamboat area is seismically active and could be subject to strong ground motion from a large earthquake on one of the many active faults in the area. Geothermal facilities would be designed to meet all building codes and seismic safety ordinances. The East Reno Fault Zone passes through Section 34. There may be other active faults in the lease area. Geotechnical studies should be performed before facilities are designed to ensure that they are not sited on an active trace of the fault; geothermal facilities, wells, or pipelines could be damaged. However, relative to other risks associated with a large earthquake, the potential risk of impacts on public health or the environment from geothermal power plant damage is low.

Mineral Resources. Section 34 includes alluvial fans at the foot of the Virginia Range. The alluvium has been mined as a source of sand and gravel. Similarly, there are several rock

borrow pits in Section 36, which is on the northwest slope of the Steamboat Hills. Section 8 contains an abandoned mine and a number of prospects. There is also an abandoned mine in the southwest quarter of Section 12. As discussed above, geothermal development is not likely to significantly reduce access to or to affect future development of mineral resources in the lease area. There is a low potential risk for impacts on mineral resources.

Hazen KGRA and Noncompetitive Lease Area

Soils. Ground disturbance during construction of roads, utility lines, and structures may increase the potential for soil erosion either by runoff, or by wind. Wind erosion is likely to be a more significant mechanism for soil loss than rainfall, because it occurs more frequently and is able to re-distribute eroded soil more widely. Runoff capable of transporting significant amounts of soil occurs infrequently. The amount of land area that would be affected by ground-disturbing activities is expected to be generally small, except where new roads and power transmission lines would be constructed. Nevertheless, in some areas, soil erosion resulting from ground disturbance may create permanent scars on the landscape, and loss of soil may prevent vegetation from becoming established on the disturbed area. Construction of new roads and utility lines would be done in compliance with permit requirements, including any state and local requirements to implement non-point source pollution prevention measures during construction. There is a low potential risk for impacts on soils from future geothermal activities.

Seismicity. Geothermal power production is not expected to have any impact on the frequency or magnitude of significant seismic events, although seismic events detectable with instruments (rather than be humans) may be induced by circulation of geothermal fluids under certain conditions. Earthquakes on faults in or beyond the project area could cause ground shaking of a magnitude that would damage structures or facilities. Structures and facilities will be constructed to current building code standards, so that seismic hazards will be reduced to acceptable levels. There is a low potential risk for impacts on seismic activity.

Mineral Resources. Although the area contains marginal mineral resources, including sand and gravel for building materials, and metal deposits, construction and operation of geothermal production plants is not expected to significantly affect access to minerals, or mineral production. Geothermal exploration, including drilling deep wells, may have the beneficial impact of identifying additional, previously unrecognized, mineral deposits. There is a low potential risk for impacts on mineral resources.

Soda Lake KGRA and Noncompetitive Lease Area, Stillwater KGRA, Salt Wells KGRA and Noncompetitive Lease Area, Lee Hot Springs Noncompetitive Lease Area, Aurora Crater Noncompetitive Lease Area, and Wabuska Noncompetitive Lease Area

The potential risk of indirect effects from geothermal leasing on soils, seismicity, and mineral resources is expected to be low, for the reasons described above for the Hazen KGRA.

4.3 WATER RESOURCES

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to water resources. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of Proposed Action

Leasing land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction. Therefore, there would be no direct impact on water resources.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting water resources is assessed with respect to six significance criteria. Potential impacts on water resources could occur if reasonably foreseeable future actions were to result in any of the following:

- Violate promulgated federal, state, or local water quality standards or objectives;
- Impair existing or potential beneficial uses of waters of the US or of Nevada;
- Result in water or sediment quality conditions that could be harmful to aquatic life or human health, even if an accepted standard were not formally violated;
- Increase the potential for a substantial off-site flood hazard (substantial flood hazard is greater than one percent, or once in a hundred years);
- Result in erosion or sedimentation that would alter or impair the course of a permanent stream or substantially alter the area or capacity of a surface water feature; or
- Result in uses or facilities that would substantially degrade surface or groundwater quality.

The potential risk assessment of indirect impacts affecting water resources from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect

impacts on water resources in the region of influence. The assessment is described below and summarized in Table 4-1.

All Proposed Lease Areas

Surface Water. Geothermal plants produce wastewater from cooling tower blowdown during normal operations, and from testing of production wells at startup and periodically after that. Water in water-cooled systems periodically needs to be replenished due to evaporative losses. The original coolant water and the replenishment water contains salts, and these become concentrated in the cooling system over time, requiring that the coolant be periodically replaced. The cooling water may also contain metals or other constituents introduced from corrosion of pipes or from the use of chemicals to inhibit corrosion or microbial growth in the system. The spent water that is periodically discharged from the cooling system is called blowdown. Once a plant is operational, all excess fluids are injected. Surface discharge of cooling water blowdown would need approval.

The water used in cooling could be from local groundwater. The specific nature of any impacts related to the generation of wastewater would not be known until the specific development proposal is submitted. Any potential impacts would be addressed through NPDES permit requirements.

Additives must be added to the coolant to prevent corrosion, and the coolant may contain some dissolved metals from the piping. Low-toxicity additives are available that could be used in the cooling towers to lower the potential for impacts from this source.

Any discharge of cooling tower blowdown would require an National Pollution Discharge Prevention System (NPDES) permit from the State of Nevada Department of Environmental Protection (NDEP), which would require testing to ensure that the water met the discharge requirements. It is likely that the water would be discharged either to the ground or to an evaporation pond. The state could require that the water be discharged to a lined pond to prevent infiltration. Therefore, the potential for water quality impacts on surface water from discharges of a geothermal plant are expected to be less than significant or mitigable.

Flooding. Some of the proposed lease areas are either within a delineated 100-year flood zone or may be in areas subject to periodic flooding where the flood hazard has not yet been determined. It may not be necessary to construct facilities or install wells in these areas. However, the established 100-year flood zones, and unknown flood potential, represent a potential constraint on geothermal development that would need to be evaluated in future environmental documentation.

Groundwater. Discharge of cooling tower blowdown or water from testing of geothermal production wells could affect shallow groundwater quality if the discharged water percolated to a shallow aquifer. As discussed for surface water, the discharge of cooling tower blowdown water would be subject to an NPDES permit issued by the NDEP.

Therefore, the permit holder would be required to demonstrate that the discharge did not degrade groundwater quality.

The source of the makeup water would likely be groundwater from local production wells. Makeup water is the water used to replace or make up for the evaporative losses and blowdown in a water-cooled system. The quantity of cooling tower blowdown depends on the size of the power plant, the quality of the make-up water (lower quality water requires more frequent cycling), the nature of the additives to prevent scale, and the number of times the water is cycled. The size of the power plants would depend on a number of factors that cannot be predicted, including the demand for electricity and the productivity of the geothermal resources at the sites. The two power plants in the Steamboat I facility each have a capacity of 11.3 mw, but small modular units of about one megawatt capacity, or larger plants could be built. A 3.6 mw power plant consisting of three individual 1.2 mw units proposed for the Soda Lake KGRA was estimated to require discharge of about 100 acre-feet of blowdown water per year (Chevron Resources Company 1987). Thus, for estimation purposes, geothermal power production may require on the order of 25 acre-feet of discharge per megawatt of electricity produced per year. This is equivalent to about 15 gallons per minute discharged on a continuous basis. Since blowdown operations would occur when needed, the actual discharge rate, and the rate of replacement of the makeup water, would be higher, and was estimated by Chevron Resources, Inc., to be about 200 to 375 gpm for the 3.6 mw system. The impacts on groundwater resources would depend on the size of the plant(s) and the quality of the groundwater. Lack of sufficient quantities of groundwater could potentially represent a constraint on geothermal production feasibility in some areas.

Steamboat KGRA and Noncompetitive Lease Area

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. Impacts from discharge of cooling tower blowdown water, if this method of cooling were used, or from water generated during testing of geothermal production wells, would be prevented through compliance with an NPDES discharge permit from the NDEP. The potential risk for impacts on surface water would be low.

Flooding. Some of the project area is within the 100-year flood zone, as determined by the Federal Emergency Management Agency (FEMA). It may not be necessary to construct facilities or to install wells in areas subject to flooding. However, the 100-year flood zones represent a potential constraint on geothermal development that would need to be evaluated in future environmental documentation. Because building codes and other building requirements are likely to determine the placement of structures in flood zones, the risk of potential impacts from flooding would be medium.

Groundwater. Existing demand for potable water in southern Washoe County is nearing the available supply. The County is evaluating options for increasing the municipal water supply, including purchasing irrigation water rights, conservation (such as using

reclaimed water), and conjunctive use (storing excess surface water in the groundwater aquifer). Although any significant additional demand for groundwater as a source of geothermal cooling makeup water is likely to further stress available supplies, reclaimed water could be used for cooling with no impact on supplies. There is a medium risk for potentially significant impacts on groundwater supplies from the use of groundwater for geothermal activities.

A small potential for adverse impacts on groundwater quality exists if the cooling water evaporation ponds recharge shallow groundwater. The potential risk of impacts is expected to be low because the discharge ponds would be monitored in accordance with a permit from the NDEP.

Hazen KGRA and Noncompetitive Lease Area

Surface Water. During construction, ground disturbing activities, such as construction of roads, foundation pads, and installation of utilities could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. However, there are no perennial streams in the area. In areas of higher than average erosion potential, Best Management Practices to reduce sediment erosion and to prevent sediment from being transported to wetland areas would be implemented in compliance with non-point (stormwater) pollution prevention requirements of the Clean Water Act. Similarly, petroleum product or other chemical spills that may occur during construction would be cleaned up, in compliance with State and local permit requirements.

As described above, for the Steamboat KGRA, geothermal power plants may require water for cooling, and therefore may generate wastewater from cooling tower blowdown, and from testing of new geothermal production wells. Discharge of blowdown or geothermal well water would require an NPDES permit, and compliance with permit requirements is expected to reduce potential impacts on receiving water quality to less than significant levels. Overall, there is a low potential risk for impacts on surface water.

Flooding. As described above for the Steamboat Springs KGRA, some of the project area lies within a 100-year flood zone. This zone and the potential for flooding represent a potential constraint on geothermal development that would need to be evaluated in future environmental documentation. Because building codes and other building requirements are likely to determine the placement of structures in flood zones, the risk of potential impacts from flooding would be medium.

Groundwater. High quality groundwater is not abundant in the Fernley area; however, local groundwater supplies may be adequate for geothermal power production purposes. There is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal cooling.

Water for steam or hot water production would be re-circulated, requiring little, if any new water to maintain production.

Soda Lake KGRA and Noncompetitive Lease Area

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. As described above for the Hazen KGRA, discharge of cooling water from geothermal plants is unlikely to result in significant impacts on surface water in the Soda Lake KGRA because the surface water quality in the study area is generally poor, and because any discharge would be in compliance with NPDES permit requirements. There is a low potential risk for impacts on surface water.

Flooding. As described above for the Steamboat Springs KGRA, some of the project area may lie within a 100-year flood zone or in an area subject to flooding that has not yet been mapped by FEMA as a flood zone. The potential for flooding represents a potential constraint on geothermal development that would need to be evaluated in future environmental documentation. Because building codes and other building requirements are likely to determine the placement of structures in flood zones, the risk of potential impacts from flooding would be medium.

Groundwater. As described above, groundwater resources are probably adequate to meet the needs of geothermal power plants, if the plants are water-cooled. Discharge of wastewater is unlikely to impact groundwater quality. There is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal activities.

Stillwater KGRA

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. As described above for the Hazen KGRA, impacts on surface water from construction and operation of geothermal plants are expected to be less than significant. There is a low potential risk for impacts on surface water.

Flooding. As described above, some of the project area may lie within a 100-year flood zone or in an area subject to flooding that has not yet been mapped by FEMA as a flood zone. The potential for flooding represents a potential constraint on geothermal development that would need to be evaluated in future environmental documentation. Because building codes and other building requirements are likely to determine the placement of structures in flood zones, the risk of potential impacts from flooding would be medium.

Groundwater. As described above for the Hazen KGRA, impacts on groundwater from operation of geothermal plants are expected to be less than significant. There is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal activities.

Salt Wells KGRA and Noncompetitive Lease Area

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. For the reasons described above for the Hazen KGRA, no significant indirect surface water impacts are expected to result from geothermal leasing in the Salt Wells KGRA. There is a low potential risk for impacts on surface water.

Flooding. As described above, some of the project area may lie within a 100-year flood zone or in an area subject to flooding that has not yet been mapped by FEMA as a flood zone. The potential for flooding represents a potential constraint on geothermal development that would need to be evaluated in future environmental documentation. Because building codes and other building requirements are likely to determine the placement of structures in flood zones, the risk of potential impacts from flooding would be medium.

Groundwater. For the reasons described above for the Hazen KGRA, no significant indirect groundwater impacts are expected to result from geothermal leasing in the Salt Wells KGRA. There is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal activities.

Lee Hot Springs Noncompetitive Lease Area

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. For the reasons described above for the Hazen KGRA, no significant indirect surface water impacts are expected to result from geothermal leasing in the Lee Hot Springs Noncompetitive Lease Area. There is a low potential risk for impacts on surface water.

Groundwater. For the reasons described above for the Hazen KGRA, no significant indirect groundwater impacts are expected to result from geothermal leasing in the Lee Hot Springs Noncompetitive Lease Area. There is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal activities.

Aurora Crater Noncompetitive Lease Area

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. Geothermal leasing is not expected to have any significant indirect impacts on surface water resources in the Aurora Crater Noncompetitive Lease Area, for the reasons described above for the Hazen KGRA. There is a low potential risk for impacts on surface water.

Groundwater. No indirect impacts on groundwater quality or quantity are expected to result from geothermal leasing in the Aurora Crater Noncompetitive Lease Area. There

is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal activities.

Wabuska Noncompetitive Lease Area

Surface Water. During construction, ground-disturbing activities, such as road and foundation pad construction and utility installation, could lead to an increase in soil erosion, with the result that more soil might be transported in surface runoff. Geothermal leasing is not expected to have any significant indirect impacts on surface water resources in the Wabuska Noncompetitive Lease Area, for the reasons described above for the Hazen KGRA.

Flooding. As described above, some of the project area may lie within a 100-year flood zone or in an area subject to flooding that has not yet been mapped by FEMA as a flood zone. The potential for flooding represents a potential constraint on geothermal development that would need to be evaluated in future environmental documentation. Because building codes and other building requirements are likely to determine the placement of structures in flood zones, the risk of potential impacts from flooding would be medium.

Groundwater. No indirect impacts on groundwater quality or quantity are expected to result from geothermal leasing in the Wabuska Noncompetitive Lease Area. There is a low potential risk for impacts on groundwater supplies from the use of groundwater for geothermal activities.

4.4 CULTURAL AND NATIVE AMERICAN RESOURCES

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to cultural and Native American resources.

Direct Impacts of Proposed Action

Leasing land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction, so there would be no direct impact to any cultural or Native American resources.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Cultural Resources Sensitivity Methodology. The BLM conducted a Class I records search for all KGRAs and noncompetitive lease areas in order to access cultural resources sensitivity. The search was of records on file at the BLM Carson City Field Office, including survey reports, site records, and Government Land Office maps. The purpose of the records search was to identify lease areas that contained documented cultural resources and areas that had been previously surveyed. In addition to documented properties within the parcels, the BLM reviewed sites and surveys near the lease areas to help analyze areas that had not been surveyed. The cultural resources sensitivity assessment consisted of a review of landforms and other topographical qualities. Certain landforms and associated natural resources, such as water, are known to be magnets for past human activity. By default, because geothermal resources involve water, areas surrounding these resources have proven to be culturally sensitive. Prehistoric topographical features also known to contain numerous cultural resources, such as ancient shorelines, were analyzed as part of the sensitivity rating. In some cases, resource information was provided through consultation with other federal agencies that manage the land where the resource area is located.

Section 106 of the NHPA states that an undertaking would have an effect on a historic property (i.e., NRHP-eligible resource) if that undertaking were to alter those characteristics of the property that qualify it for inclusion in the NRHP. An undertaking is considered to have an adverse effect on a historic property when it diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Future actions based on the reasonable development scenario could result in indirect impacts on an historic property. The potential risk of these indirect impacts is assessed with respect to four significance criteria. Potential impacts on these resources could occur if reasonably foreseeable future actions:

- Isolate the property or alter the character of the property's setting when that character contributes to the property's qualifications for the NRHP;
- Introduce visual, audible, or atmospheric elements that are out of character with the property or changes that may alter its setting;
- Cause a property to be neglected, resulting in its deterioration or destruction; and

- Result in the transfer, lease, or sale of a property without adequate provisions to protect the property's historic integrity.

The potential risk assessment of indirect impacts affecting historic properties from exploration, development, production, or closeout is based on a scale that rates each area from high-to-low. The following definitions of high, medium, and low for cultural resources are assigned according to the potential future risk of indirect impacts in the region of influence:

- Low sensitivity—Describes an area where sites have been previously recorded but not surveyed, where some portions of the sites have been surveyed, where surveys of nearby sites were negative, or where landform and topography do not suggest the likelihood of unrecorded significant resources.
- Medium sensitivity—Describes areas where there may be some recorded resources, where some nearby sites been some surveyed but no recorded resources have been found, or where landforms and topography suggest the presence of unrecorded resources.
- High sensitivity—Describes areas that may have numerous recorded resources, where significant or numerous resources have been recorded, that are a part of a delineated NRHP historic district, or whose landforms or topographic qualities are known to be highly sensitive.

Native American Resources Sensitivity Methodology. As required by law, the BLM consulted with Native American tribes associated with each geothermal resource area. Significant effects on Native American resources may consist of any action that alters any characteristic of a resource that contributes to its importance to Native Americans. The significance of an effect to a Native American resource is determined based on the importance of the resource to Native American groups and the type of effect the overall project would have. This may include changes to both the resource and to the setting of the resource. Many sacred areas, because they have spiritual association, do not easily fall into categories, such as the ones used here to describe sensitivity. Lakes, rivers, and especially springs are known to be important spiritual places to Native Americans; as such, proximity to any geothermal resource would suggest a probability that the area is sensitive to Native Americans. To facilitate the sensitivity model, responses from Native American tribes were used in the ways described below.

- Low sensitivity areas are those that Native American tribal representatives did not specifically express as being of concern or importance, and that are not near surface geothermal resources, and that do not contain landforms or dramatic topographical features.
- Medium sensitivity areas are those that Native American tribal representatives may not have specifically identified but that, due to the area's cultural sensitivity, are likely to become areas of concern, or that,

based on landform and proximity to aboveground resources or topographical characteristics, are likely to contain TCPs.

- High sensitivity areas are those that Native American tribal representatives have identified as highly sacred, that contain known TCPs, that are near known sensitive areas, or that are within historic districts.

All KGRAs and Noncompetitive Lease Areas

Table 4-1 shows the cultural resources sensitivity ratings and the Native American resources sensitivity ratings for the KGRAs and the noncompetitive lease areas. Lease stipulations include provisions for full compliance with all federal legislation and federal guidelines regarding both cultural and Native American resources. Areas that contain significant cultural resources may be mitigated through data recovery or other appropriate methods. A possible exception to this may be historic properties where intrusion of geothermal plants would destroy the integrity of a nearby property's setting. Areas that have a highly sensitive Native American component likely represent a nonrenewable resource, and any impacts would be considered significant and difficult to mitigate because of irreversible impacts associated with geothermal resource development. For example, disturbing the surface of areas with sacred value to Native Americans would permanently damage the resource.

4.5 BIOLOGICAL RESOURCES

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to biological resources, including wildlife, fisheries, and migratory birds, threatened and endangered species, and vegetation and noxious weeds.

Geothermal activities could affect biological resources in a variety of ways. The exploration, development, and production phases all involve certain activities, any of which may have effects on biological resources, either adverse or beneficial, or short- or long-term. Some of these possible impacts will be described below.

Exploratory drilling and associated surface disturbances could cause soil to become contaminated. The pollutants or disturbed soil could be transported through surface water runoff to water sources, such as creeks or ponds. Flora and fauna that rely on the water for habitat could be harmed by the pollutants or turbidity caused by the soil.

Development and production phases can have impacts related to construction activities (and these may be short- or long-term), including presence of noise, changes in habitat from buildings, and from maintenance activities. Above-ground obstacles such as transmission and phone lines, and well drilling structures could cause bird mortalities from collision or electrocution. Transmission lines may also offer perching locations for birds of prey in the vicinity of sensitive prey species, such as the sage grouse.

Waterfowl and raptors would be most affected especially if these lines were located in flyways or over nesting or feedings sites. Small birds which depend upon a particular vegetative zone as a source of food also would be vulnerable to serious loss of habitat within an area. Many small bird species are narrowly adapted to certain vegetation community types. Therefore, removal of vegetative cover could be detrimental to certain species in terms of their foraging and reproduction needs. In particular, waterfowl need cover for escape, nesting, and brood raising. The elimination of habitat in any of the present waterfowl use areas could have significant impacts.

Finally, as development occurs through test drilling and production testing stages, physical land modification, and human occupation would occur. Such activities as construction of roads, ponds, drill sites, well drilling, building of generation facilities and transmission facilities could decrease habitat value for wildlife. The permanence of these effects would depend on the nature of the specific construction or operational activity in a particular area. Many biological resources have the ability to adapt to human-related disturbance and noise, which would decrease the adverse impacts that may result from the above activities.

Wildlife could also be affected by increases in poaching or hunting that is made easier by changes in habitats, increases in road access, etc. Other potential impacts on wildlife may result from improperly planned or executed handling of geothermal fluids. Uncontrolled releases, spills, seepage or well blowouts could result in addition of toxic, mineralized, or saline geothermal waters to streams, ponds, etc., and adverse impacts

would result. Impacts could include alteration of fishery habitat or waterfowl nesting and feeding areas, via increases in the toxicity of habitat areas, changes in temperatures, increases in turbidity, etc. Any large-scale reduction in vegetative cover could affect distribution and abundance of wildlife by reducing forage and cover. Competition for available food resources could result, which may change migration patterns, or cause decline in population health and numbers.

Direct Impacts of Proposed Action

The leasing of land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction; therefore, there would be no direct impact on any of the following biological resources:

- Wildlife resources, fisheries, or migratory birds;
- Threatened or endangered species; or
- Vegetation, riparian areas, or noxious weeds.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting biological resources is assessed with respect to seven significance criteria. Potential impacts on biological resources could occur if reasonably foreseeable future actions were to:

- Adversely affect a population of a threatened, endangered, regulated, or other sensitive species, for example, by reducing numbers, by altering behavior, reproduction, or survival, or by causing the loss or disturbance of habitat; any "take" of a listed or sensitive species is considered significant;
- Adversely affect a species, natural community, or habitat that is specifically recognized as biologically significant in local, state, or federal policies, statutes, or regulations;
- Adversely affect a species, natural community, or habitat that is recognized for scientific, recreational, ecological, or commercial importance;
- Impede fish or wildlife migration routes for a period that would significantly disrupt that migration;
- Alter or destroy habitat that would prevent biological communities that inhabited the area prior to the project from reestablishing;
- Extensively alter or cause the loss of biological communities in high-quality habitat for longer than one year; or
- Affect unique communities or communities of limited distribution within the project area.

The potential risk assessment of indirect impacts affecting biological resources from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts on biological resources in the region of influence. The assessment is described below and summarized in Table 4-1.

Wildlife, Fisheries, and Migratory Birds

Steamboat KGRA and Noncompetitive Lease Area. This area contains winter habitat for mule deer in the southeastern portion of this KGRA. The winter range for deer has currently been greatly reduced by previous human encroachment. Loss and fragmentation of wintering habitat and migration corridors for mule deer have greatly affected the populations of this species in this region. Additional ground disturbance and development as a result of geothermal activities in deer wintering habitat area could negatively affect mule deer populations in this area. Reduction in habitat value (as a result of exploration, development, and production activities) or of habitat area coverage, which is critical to their survival during the winter months, could have an adverse impact on mule deer. Lease stipulations identified would reduce the level of potential impact through avoidance or seasonal occupancy restrictions.

Many small common mammal species are found in this area, including various rabbit and hare, mouse, gopher, kangaroo rat, and squirrel species, as well as skunk and fox that prey on these smaller mammal species. Bird species may pass through or fly over the property. Some of these species are adapted to human encroachment and most likely would not be significantly affected by this project activity. Also, populations of plants and animals and the diversity of migratory bird species within habitat communities fluctuate naturally.

This area contains riparian habitat in some sections proposed for leasing. Riparian habitat is of high value to numerous fish, wildlife and migratory bird species. The following areas contain riparian habitat: Section 34, east of Steamboat Creek, has some riparian habitat. Several tributary washes to Steamboat Creek drain northwest through Section 34 across alluvial fans at the foot of the Virginia Range. Whites Creek drains northeastward across a large fan on the lower slope of Mount Rose, near the north side of Section 36 just north of Highway 431. Galena Creek, a tributary to Steamboat Creek, flows into Pleasant Valley across the center of Section 12. Steamboat Creek and a portion of Galena Creek drains northeast through the northwest quarter of Section 8.

Avoidance of impacts on riparian habitat could present low to moderate limitations on siting geothermal facilities in these areas.

Potential development proposed in lease sections containing or adjacent to stream channels, or on minor tributaries to streams, including Steamboat Creek (T17N 20E section 8), Galena Creek (T17N 19E section 12), and Whites Creek (T18N 19E section 36) could negatively affect fisheries. Adverse effects to fish habitat would be possible in the exploration, development, and production activities related to this project. Construction activities along waterfront areas could affect wetland habitat and habitat for fish species. Future development in this area could result in increased potential for nonpoint pollution of surface water, increased turbidity as a result of sediment release etc. Any toxic or treated materials or discharges into rivers could have adverse effects on fish species. These impacts on sensitive habitats would be minimized through required pre-construction permitting and agency consultation. Removal of vegetation could have adverse impacts on wildlife and bird species as described above. Adverse impacts on riparian areas would be mitigated by lease stipulations requiring avoidance of any riparian area by 650 feet.

Additional potential impacts on riparian corridors are discussed further below. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be medium.

Hazen KGRA and Noncompetitive Lease Area. The Hazen KGRA and noncompetitive lease area overlaps with the Fernley State WMA. Wetland and riparian habitat is most likely to occur in the western portion of the lease area where it overlaps with the Fernley WMA (T20N 25E sections 2, 10, 12, and 14; T20N 26E section 6). Although no surveys for wetland or riparian resources were conducted as part of this analysis, based on available reports, mapping, and input from BLM resource specialists, the risk of impacts on wetland and riparian habitat from leasing in this area is estimated to be high. Potential impacts may result from various exploration and development activities described above, but which mainly involve presence of geothermal fluids via uncontrolled releases, spills, seepage or well blowouts which could result in increases in toxic, mineralized, or saline waters to streams, ponds, etc. Impacts could include alteration of fishery habitat, waterfowl nesting and feeding areas, or riparian corridors important for wildlife species. Any large-scale reduction in vegetative cover could affect distribution and abundance of wildlife by reducing forage and cover. Lease stipulations for avoidance of wetland habitat defined in Appendix D would reduce the potential level for impact.

The wetland habitats within the Hazen KGRA and noncompetitive lease area provide habitat for a variety of migratory birds. The BLM is required to analyze the impacts of any action upon migratory birds, under the Migratory Bird Treaty Act. The likelihood of disturbing nests of such birds is limited to certain seasons. Alternatively, cooling and process water ponds may function to attract migratory birds. Waterfowl, shorebirds, and other bird life which depend on food, water, and cover in riparian zones along stream courses, wet meadows, marshes and spring areas are considered at risk if

vegetation in these areas is damaged or altered by project activities. Waterfowl, raptors and small birds which depend upon a particular vegetative zone as a source of food or cover could be vulnerable to loss of habitat within an area as a result or project activities. Removal of vegetative cover could be detrimental to certain species in terms of their foraging and reproduction needs. In particular, waterfowl need cover for escape, nesting, and brood raising. The elimination of habitat in any of the present waterfowl use areas could have significant impacts. Changes in water management, including reduction of wetlands or increased development in the area could adversely affected the abundance and diversity of birds in the area. Lease stipulations to avoid ground disturbance activities during the migratory bird nesting season to avoid potential violation of the Migratory Bird Treaty Act, would reduce the potential for significant impacts on migratory birds.

Other resident wildlife species, such as the small to mid-sized common mammal species typically found in such areas, would not be adversely affected by this project activity. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be low.

Soda Lake KGRA and Noncompetitive Lease Area. Wetland and riparian habitat is likely to occur throughout the lease area but primarily in the southern portion of the area. Soda Lake is within one section proposed for leasing (T19N R28E section 8). The Carson River crosses through several sections proposed for leasing (T20N R29E sections 28, 33, and 34). Several small wetland areas may occur in other areas (T20N R28E section 35; T19N R28E sections 2, 3, 4, and 10). Other areas contain drains (T20N R28E section 10; T20N R29E section 27). Although no surveys for wetland or riparian resources were conducted as part of this analysis, based on available reports, mapping, and input from BLM resource specialists, the risk of impacts on wetland and riparian habitat from leasing in this area is estimated to be high. Potential impacts on fish, wildlife, or bird species from modification of this habitat would be similar to those described for the Steamboat and Hazen areas. Lease stipulations for avoidance of wetland habitat defined in Appendix D would reduce the potential for substantial impacts.

The wetlands in this area provide habitat for several migratory bird species. Lease stipulations include the measure that the project proponent should avoid ground disturbance activities during the migratory bird-nesting season to avoid potential violation of the Migratory Bird Treaty Act. This measure combined with the avoidance of wetlands would reduce the potential impact on migratory birds to less than significant.

Potential impacts on other resident wildlife species would not be significant, similar to that described above for the Hazen area. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be low.

Stillwater KGRA. The Stillwater KGRA overlaps with the Stillwater NWR and is adjacent to the Stillwater WMA. Actual tracts proposed for leasing are not within the

NWR or WMA. Wetland and riparian habitat is most likely to occur in the southern part of lease area where the Stillwater Slough crosses proposed lease tracts (T19N 30E sections 24, 25, and 26) and the northern part of the lease area adjacent to Indian Lakes (T20N 30E section 31). Although no surveys for wetland or riparian resources were conducted as part of this analysis, based on available reports, mapping, and input from BLM resource specialists, the risk of impacts on wetland and riparian habitat from leasing in this area is estimated to be high. Potential impacts on fish, wildlife, or bird species from modification of this habitat would be similar to those described for the Steamboat and Hazen areas. Lease stipulations for avoidance of wetland habitat defined in Appendix D would reduce the potential for substantial impacts. Potential conflicts resulting from issuing leases on lands adjacent to the Stillwater NWR, the Fallon NWR, and the Stillwater WMA may require greater future environmental analysis than issuing leases on lands not adjacent to the wildlife areas and refuge.

This area contains wetlands providing habitat for numerous migratory waterfowl and shorebirds. Lease stipulations include the measure that the project proponent should avoid ground disturbance activities during the migratory bird-nesting season to avoid potential violation of the Migratory Bird Treaty Act. This measure combined with the avoidance of wetlands would reduce the potential for impact on migratory birds.

Potential impacts on other resident wildlife species would not be significant, similar to that described above for the Hazen area. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be low.

Salt Wells KGRA and Noncompetitive Lease Area. The noncompetitive leases within the Salt Wells area are immediately adjacent to the Carson Lake Pasture Area (T17N 30E sections 5, 8, 17, 20, 29, and 32). This area has high importance for migratory routes and wildlife management. Wetland habitat is likely to occur in the areas adjacent to Carson Lake. Although no surveys for wetland or riparian resources were conducted as part of this analysis, based on available reports, mapping, and input from BLM resource specialists, the risk of impacts on wetland and riparian habitat from leasing in these adjacent areas has been estimated to be high. Lease stipulations for avoidance of wetland habitat defined in Appendix D would reduce the potential for substantial impacts.

The wetland habitats within this area provide habitat for a variety of migratory birds. The BLM is required to analyze the impacts of any action upon migratory birds, under the Migratory Bird Treaty Act. The likelihood of disturbing nests of such birds is limited to certain seasons. Alternatively, cooling and process water ponds may function to attract migratory birds. Waterfowl, shorebirds, and other bird life which depend on food, water, and cover in riparian zones along stream courses, wet meadows, marshes and spring areas are considered at risk if vegetation in these areas is damaged or altered by project activities.

Lease stipulations include the measure that the project proponent should avoid ground disturbance activities during the migratory bird-nesting season to avoid potential

violation of the Migratory Bird Treaty Act. This measure combined with the avoidance of wetlands would reduce the potential impact on migratory birds to less than significant.

Potential impacts on other resident wildlife species would not be significant, similar to that described above for the Hazen area. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be low.

Lee Hot Springs Noncompetitive Lease Area. This proposed lease area contains upland habitat consistent with the habitat in the surrounding area. Exploration and development would affect only a small area relative to the available upland habitats. Potential impacts on other resident wildlife species would not be significant, similar to that described above for the Hazen area. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be low.

Aurora Crater Noncompetitive Lease Area. The Aurora Crater noncompetitive lease area is on the edge of the Humboldt-Toiyabe National Forest in the Bridgeport Ranger District. This area is within the summer range for the pronghorn antelope and the critical range for the desert bighorn sheep. As a result, antelope may be negatively affected by the construction of fencing and other developments. Activities which result from exploration, drilling and development of geothermal leases may produce noise or other construction related impacts that could disturb these species. In order to reduce these impacts the lease should stipulate construction of fences that allow the passage of antelope.

Potential impacts on other resident wildlife species would not be significant, as described above for the Steamboat area. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be medium.

Wabuska Noncompetitive Lease Area. Riparian/lowland habitat occurs in the Wabuska lease area in sections for which lease applications have been filed (T15N R25E sections 15, 16, and 23). Leasing in these sections would require adherence to lease stipulations to maintain adequate setbacks from these. Wetland habitat is found a couple miles to the southeast in the Mason Valley WMA. The wetland areas are sloughs that receive overflow from the Walker River. No surveys for wetland or riparian resources were conducted as part of this analysis, however, based on available reports, mapping, and input from BLM resource specialists, the risk of impacts on wetland and riparian habitat from leasing is estimated t to be high. Standard lease stipulations defined in Appendix D would reduce the potential for substantial impacts. Potential impacts on other resident wildlife species would not be significant, similar to that described above for the Hazen area. Overall, the potential risk for impacts on wildlife, fisheries, and migratory birds would be low.

Special Status Species

Steamboat KGRA and Noncompetitive Lease Area. Ten federal species of special concern may occur in the Steamboat KGRA, including eight bat species. Changes to hydrology

in the lease areas may affect a bat's source of food and water. Also, cleared land for geothermal resource development may diminish roosting and breeding habitat.

The two remaining species of special concern that may occur in the area are the pygmy rabbit and the western burrowing owl. Should these two species be present in the area they may be negatively affected by ground-disturbing activities. Project design or size could be adjusted or deferred as part of the site approval process by BLM or the county to minimize impacts. Additional sensitive species, such as the altered andesite buckwheat, found in the area are identified in Table 3.5-1. Lease stipulations in Appendix D would provide for protection of any special status species found in this area. Overall, the potential risk for impacts on special status species would be medium.

Hazen KGRA and Noncompetitive Lease Area. No federally endangered, threatened or candidate species were identified as potentially occurring in this area.

Eight bat species of special concern were identified as potentially occurring in this area. These species likely rely on the wetland habitats for foraging opportunities. Impacts on bats would be similar to those described above under the Steamboat area. Lease stipulations suggest avoiding riparian areas by 650 feet to minimize impacts on riparian habitats and wildlife that depend upon them. If this measure is also applied to wetland habitats, the impact would be less than significant provided no roosting areas are removed during exploration or development.

Ground-disturbing activities may negatively affect the pygmy rabbit and western burrowing owl should these species occur in the area. These species have been identified as federal species of concern. Risk level of impacts on these species could be high because they depend on particular vegetation zones.

Overall, the potential risk for impacts on special status species would be medium.

Soda Lake KGRA and Noncompetitive Lease Area. No federally endangered, threatened or candidate species were identified as potentially occurring in this area.

Seven bat species of special concern have been identified as potentially occurring in this area. These bat species likely forage in the wetland habitats. Impacts on bats would be similar to those described above under the Steamboat area. Lease stipulations protecting wetland areas would reduce the impact on these bat species to less than significant.

The wetlands in this area provide habitat for several migratory bird species. Lease stipulations include the measure that the project proponent should avoid ground disturbance activities during the migratory bird-nesting season to avoid potential violation of the Migratory Bird Treaty Act. This measure combined with the avoidance of wetlands would reduce the potential for impact on migratory birds.

In addition, the northern goshawk may occur in the Soda Lake area. This species predominantly hunts in wooded areas, feeding on birds and small mammals. Before leasing actions would occur, an area biologist would conduct a survey for the presence of suitable habitat for the goshawk. Should there be wooded areas in the lease area, the removal of trees and ground disturbance activities in wooded habitats could negatively affect this species. Lease stipulations protecting biological resources would reduce the potential for impact on this raptor.

Ground-disturbing activities may negatively affect the pygmy rabbit and western burrowing owl should these species occur in the area. These species have been identified as federal species of concern. Risk level of impacts on these species could be high because they depend on particular vegetation zones.

Overall, the potential risk for impacts on special status species would be medium.

Stillwater KGRA. This area may contain the federally listed threatened bald eagle. Consultation with the USFWS under the ESA would be required prior to implementing exploration or development activities. Mitigation measures would need to be developed on an individual project basis in accordance with standard lease stipulations.

The northern goshawk may occur in this area. This species predominantly hunts in wooded areas, feeding on birds and small mammals. Before leasing actions would occur, an area biologist would conduct a survey for the presence of suitable habitat for the goshawk. Should there be wooded areas in the lease area, the removal of trees and ground disturbance activities in wooded habitats could negatively affect this species. Lease stipulations protecting biological resources would reduce the potential for impact on this raptor.

Ground-disturbing activities may negatively affect listed bat species, the pygmy rabbit and western burrowing owl should these species occur in the area. These species have been identified as federal species of concern. Impacts on bats would be similar to those described above under the Steamboat area. Risk level of impacts on the pygmy rabbit and western burrowing owl could be high because they depend on particular vegetation zones.

A portion of the proposed lease area has been identified as sage grouse brood/nesting area. Sage grouse do occur within one mile south of Aurora Peak, which is immediately south of the southern noncompetitive lease. Any ground- or vegetation-disturbing activities in sage grouse habitat could negatively affect sage grouse populations. For example, transmission lines associated with geothermal development would adversely affect sage grouse. Sage grouse, a federal species of concern that is an important game species and is of local interest, may occur in the project area. Essential habitats for sage grouse are breeding areas, including strutting grounds and nest sites (typically within two miles of a strutting ground), and upland meadows, which provide forage for young and adults during the summer and fall. If sage grouse are confirmed in the area, potential impacts on this species could be significant, depending on proximity of

habitat to exploration, development, and production activities. In order to reduce the potential for impacts on this species, the lease stipulations in Appendix D should be included to ensure that no activities would occur during the breeding season for the sage grouse and that any critical habitat areas for the sage grouse would be avoided during all stages of the project activities.

Overall, the potential risk for impacts on special status species would be medium.

Salt Wells KGRA and Noncompetitive Lease Area. No federally endangered, threatened or candidate species were identified as potentially occurring in this area.

A portion of Carson Lake is located within this proposed lease area. Carson Lake provides habitat for a variety of migratory birds. Lease stipulations protecting wetland habitats and migratory birds should reduce the impacts on migratory bird species to a below significant level. The same stipulations should reduce impacts on the seven bat species of concern described in Chapter 3. These impacts would be similar to those described above under the Steamboat area.

Ground-disturbing activities may negatively affect the pygmy rabbit and western burrowing owl should these species occur in the area. These species have been identified as federal species of concern. Risk level of impacts on these species could be high because they depend on particular vegetation zones.

Overall, the potential risk for impacts on special status species would be medium.

Lee Hot Springs Noncompetitive Lease Area. Sand cholla, a federal species of concern, has been documented near this area. Standard lease stipulations require the avoidance of any endangered plant species. A survey for any cacti should be conducted for all lease areas prior to any ground-disturbing activities. Also, an adequate buffer area should be established around the population to reduce impacts on less than significant.

Ground-disturbing activities may negatively affect listed bat species, the pygmy rabbit and western burrowing owl should these species occur in the area. These species have been identified as federal species of concern. Impacts on bats would be similar to those described above under the Steamboat area. Risk level of impacts on the pygmy rabbit and western burrowing owl could be high because they depend on particular vegetation zones.

Overall, the potential risk for impacts on special status species would be medium.

Aurora Crater Noncompetitive Lease Area. The federally threatened Lahontan cutthroat trout is found in this lease area, which is within the watershed for Bodie Creek. Although Bodie Creek does not flow through the area, runoff caused by geothermal activity could affect the creek, which does not currently contain cutthroat trout but may be a recovery area in the future.

A portion of the proposed lease area has been identified as sage grouse brood/nesting area. Sage grouse occur a one mile south of Aurora Peak, which is immediately south of the southern noncompetitive lease. Any ground- or vegetation-disturbing activities in sage grouse habitat, such as transmission lines associated with geothermal development, could negatively affect sage grouse populations. Sage grouse, a federal species of concern that is an important game species and is of local interest, may occur in the project area. Essential habitats for sage grouse are breeding areas, including strutting grounds and nest sites (typically within two miles of a strutting ground) and upland meadows, which provide forage for young and adults during the summer and fall. If sage grouse are confirmed in the area, potential impacts on this species could be significant, depending on proximity of habitat to exploration, development, and production activities. In order to reduce the potential for impacts on this species, the lease stipulations in Appendix D should be included to ensure that no activities would occur during the breeding season for the sage grouse and that any critical habitat areas for the sage grouse would be avoided during all stages of the project activities.

Ground-disturbing activities may also negatively affect listed bat species, the pygmy rabbit, and western burrowing owl, should these species occur in the area. These species have been identified as federal species of concern. Impacts on bats would be similar to those described above under the Steamboat area. Risk level of impacts on the pygmy rabbit and western burrowing owl could be high because they depend on particular vegetation zones.

Overall, the potential risk for impacts on special status species would be medium.

Wabuska Noncompetitive Lease Area. No federally endangered, threatened or candidate species were identified as potentially occurring in this area.

Ground-disturbing activities may negatively affect listed bat species, the pygmy rabbit, and western burrowing owl, should these species occur in the area. These species have been identified as federal species of concern. Impacts on bats would be similar to those described above under the Steamboat area. Risk level of impacts on the pygmy rabbit and western burrowing owl could be high because they depend on particular vegetation zones.

Overall, the potential risk for impacts on special status species would be medium.

Vegetation, Riparian Areas, and Noxious Weeds

Riparian habitat is of high value to numerous fish, wildlife and migratory bird species. Riparian vegetation in arid desert environments is critically important to numerous species of wildlife, fish and birds. Wetland habitats (including vernal pools, seasonal swales and drainages, and ponds and reservoirs) are also extremely valuable areas for biological resources. These habitat areas may be affected by exploration, development, and production of geothermal leases. Species that depend on stream flows associated with these habitats, and the habitats themselves, may be affected locally. The reduction of return flows may reduce flows and water levels in local streams and irrigation

ditches. The reduced flows may dewater wetland, marsh, and riparian areas, which may stress the vegetation and result in fewer species foraging or residing in these habitats. If these conditions are sustained for multiple years, then the local impacts may become more pronounced. Removal of riparian vegetation can result in slightly higher water temperatures or increased turbidity. Many species are dependent on these habitat types and use them as sources of food, water, and cover. Removing any vegetation can also provide suitable conditions for noxious weeds to grow. Noxious weeds can be found throughout the proposed lease area.

Hazen KGRA and Noncompetitive Lease Area, Soda Lake KGRA and Noncompetitive Lease Area, Stillwater KGRA, Salt Wells KGRA and Noncompetitive Lease Area, Lee Hot Springs Noncompetitive Lease Area, and Wabuska Noncompetitive Lease Area. Construction and operation on the leased sites in these areas would result in adverse but not significant impacts on vegetation. The vegetation that would be removed at each site is not unique and is abundant within each valley. Because development is expected to occur over a large number of years, the degree of surface disturbance at any given time would be considered less than significant. Impacts on vegetation could be mitigated by reseeding in accordance with standard lease stipulations.

Lease stipulations should be included requiring that proposed exploration and development areas should be surveyed prior to ground disturbance to ensure that no sensitive plant species or riparian areas are found. Should such resources be found, the areas should be avoided. Barriers should be constructed around known locations of special status plants that may be affected. Reclamation activities following closeout would be implemented as required. As a result of these practices, impacts on vegetation would not be considered significant.

Riparian habitat is found in each of these lease areas. Riparian and wetland habitat can be managed to protect the habitat values of the riparian vegetation and adjacent uplands, and conflicts with proposed project activities can be avoided through project planning. Lease stipulations may include minimizing operation of vehicles in wetland and riparian areas, educating personnel in the area about the importance of these habitat types, and monitoring these habitats on a yearly basis. All building, roads, and other facilities shall avoid all riparian areas and wetlands.

Ground disturbance in areas containing wetland vegetation would be avoided, reducing the potential for significant impacts. Overall, the potential risk for impacts would be medium.

Steamboat KGRA and Noncompetitive Lease Area. As described above, a population of the federally listed endangered Steamboat buckwheat is within the Steamboat KGRA although not within or adjacent to any tracts proposed for leasing. The Steamboat buckwheat population occurs adjacent to Section 34, T 18N, R 20E and is in close proximity to all of the proposed lease areas within this KGRA. Standard lease stipulations include the avoidance of any endangered plant species. A survey for this species should be conducted for all lease areas prior to any ground-disturbing activities

and an adequate buffer area is established around the population, impacts should be less than significant. Exploration and development of geothermal resources will require consultation with the USFWS in accordance with the Endangered Species Act.

As described above riparian and wetland habitat is found in this lease area but standard lease stipulations would reduce the potential for negative riparian vegetation impacts. Overall, the potential risk for impacts would be medium.

Aurora Crater Noncompetitive Lease Area. Ground-disturbing activities could negatively affect antelope summer grazing habitat. These areas should be surveyed and avoided where feasible. Where avoidance is not feasible, temporary disturbances should occur during the time when antelope are not present and reseeded to provide summer grazing habitat.

As described above riparian and wetland habitat is found in this lease area but standard lease stipulations would reduce the potential for negative riparian vegetation impacts. Potential impacts on all other vegetation would be similar to that described above for other lease areas. Overall, the potential risk for impacts would be medium.

4.6 VISUAL RESOURCES

This section analyzes direct affects from the proposed action and indirect impacts from reasonably foreseeable future actions to visual resources. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of the Proposed Action

Leasing land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction; therefore, there would be no direct impact to any visual resources or visual resource management regulations.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting visual resources is assessed for five significance criteria. Potential impacts on these resources could occur if reasonably foreseeable future actions:

- Have adverse effects on a scenic vista;
- Damage a scenic resource within a scenic roadway;
- Degrade the existing visual character or quality of the site and its surroundings;
- Create a new source of light or glare; or
- Are incompatible with VRM classifications.

The potential risk assessment of indirect impacts affecting visual resources from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to visual resources in the region of influence. The assessment is described below and summarized in Table 4-1.

Steamboat KGRA and Noncompetitive Lease Area

Future exploration, development, and production could involve new structures, roads, and operations, as described in Appendix C. These new structures, roads, and operations would be near areas where people live and work or where recreation takes place. The risk for potentially significant impacts to visual resources would be medium because changes to the visual character of the environment would be consistent with

the area's current VRM classification. General stipulations for geothermal resource developers are outlined in Appendix D in order to address the potential impacts to visual resources. If the Forest Service upgrades the area to a high scenic integrity class through the Northern Sierra Plan Amendment, geothermal development would have a greater impact on the aesthetics of the Steamboat Hills area.

Hazen KGRA and Noncompetitive Lease Area, Soda Lake KGRA and Noncompetitive Lease Area, Stillwater KGRA, Salt Wells KGRA and Noncompetitive Lease Area, Lee Hot Springs Noncompetitive Lease Area, and Wabuska Noncompetitive Lease Area

Future exploration, development, and production could involve new structures, roads, and operations described in Appendix C. These new structures, roads, and operations would be near areas where expansive vistas are available, where recreation takes place, or where minimal nearby development exists. The risk for potentially significant impacts to scenic vistas, the visual character of a site, and nighttime lighting would be medium because changes to the visual character of the environment would be consistent with the area's VRM classification. General stipulations for geothermal resource developers are outlined in Appendix D in order to address the potential impacts to visual resources.

The risk for potentially significant impacts to scenic resources within a scenic roadway would be low because no scenic roadways exist in these areas of future exploration, development, and production (Nevada Department of Transportation 2002).

Aurora Crater Noncompetitive Lease Area

Future exploration, development, and production could involve new structures, roads, and operations described in Appendix C. These new structures, roads, and operations would be near areas where recreation takes place or where minimal nearby development exists. The risk for potentially significant impacts to scenic vistas, the visual character of a site, and nighttime lighting would be medium because changes to the visual character of the environment would be consistent with the area's VRM classification. General stipulations for geothermal resource developers are outlined in Appendix D in order to address the potential impacts to visual resources.

The risk for potentially significant impacts to scenic resources within a scenic roadway would be low. No scenic roadways exist in the areas of future exploration, development, and production (Nevada Department of Transportation 2002).

4.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to socioeconomics and environmental justice.

Direct Impacts of the Proposed Action

The leasing of land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction. Therefore, there would be no direct adverse socioeconomic or environmental justice impacts resulting from the proposed leasing of geothermal resources. No residents, minority or low-income populations, or businesses would be displaced, and no property would be acquired.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting socioeconomics and environmental justice is assessed with respect to eight significance criteria. Potential impacts to socioeconomics and environmental justice could occur if reasonably foreseeable future actions were to:

- Affect expenditures or income within the study area associated with the project;
- Induce growth or population concentrations;
- Displace a proportion of residences in a community;
- Create a demand for additional housing that could not be sustained within the study area;
- Cause a decrease in local or study area employment;
- Displace or disrupt businesses;
- Generate student enrollment that exceeds the school district's capability to accommodate them; or
- Cause a disproportionately high and adverse impact on minority or low-income populations.

The potential risk assessment of indirect impacts affecting socioeconomics and environmental justice from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to socioeconomics and environmental justice in the region of influence. The assessment is described below and is summarized in Table 4-1.

Geothermal Resource Exploration

No long-term increases in population or growth would be induced through operation of these leases, and demand for schools would not increase. Leasing could provide a beneficial impact to the state and counties in which leasing occurs, in the form of tax revenues and increased land values. The State of Nevada receives 50 percent of the revenues collected by the federal government. Although the federal government does not pay property tax, persons who hold leases to government lands are subject to taxation of the possessory interest value of that lease, and tax revenue to the county from geothermal development would be likely to be the same regardless of ownership. Land values for private tracts of land bordering geothermal development areas could increase, based on the development potential, and possible profitability, exhibited on adjacent geothermal lands. Potential increased land values for adjacent private land could provide indirect revenue to Churchill, Lyon, Mineral, and Washoe counties.

Geothermal exploration involving the installation of temperature gradient wells could temporarily increase employment in the local area surrounding the geothermal resource. Seismic testing crews usually employ about 20 workers for about three or four months in an area. Expenditures for equipment fuel, lodging, food, and other needs would provide a stimulus to the local economy over the duration of the drilling. The potential risk for impacts to socioeconomics or environmental justice resulting from surveying of geothermal resources is expected to be low.

Geothermal Resource Development

No residents, minority or low-income populations, or businesses would be displaced, and no property would be acquired as a result of geothermal development. Depending on the size and location, geothermal development could have a substantial beneficial effect on the surrounding economy. Geothermal resource development could involve considerable construction employment for installing access roads, pipelines, transmission lines, drill sites, and power plants, depending on the resource potential. Setting up and drilling a well can employ approximately 20 workers for about three or four months in an area. Most of the workers would not be local, although some locals may obtain employment in road and pipeline construction. Each well could cost as much as $2.5 million when reservoirs, which are relatively deep, are being drilled. New geothermal power plants would come on line over a period of two to ten years. Approximately 40 drill crew members and 200 additional people would be involved in the construction of a typical plant. Transmission facilities would be constructed concurrently with power plants. Approximately 190 construction personnel are typically employed in the construction of 100 miles of transmission line. All the personnel involved in well and transmission line construction would be temporary. Communities near geothermal development would be required to supply services, but geothermal development would provide revenues to offset the cost of supplying these services.

Another possible benefit would be to broaden the economic base of the communities within the region of influence of geothermal resource area.

Expenditures for equipment, materials, fuel, lodging, food, and other needs would stimulate the local economy over the duration of development, which could extend to 10 to 30 years. As identified in Section 3, Mineral County alone of the study area counties experienced the only decrease in construction employment between 1990 and 2000, and employment in the mining and extractive industries in Churchill and Washoe counties declined over this period and increased by only one percent in Lyon County. Large-scale geothermal development could improve these figures, but increased population growth and limited available housing, particularly in Churchill and Mineral counties, could be adverse effects of aggressive geothermal development.

Air emissions, water quality, noise, cultural, geologic, hazard and aesthetic impacts, potentially resulting from geothermal development, could adversely affect Native American populations on lands adjacent to leasing areas. The most sensitive areas for environmental justice effects would be the Stillwater leasing area, which is adjacent to the Fallon Indian Reservation, and the Lee Hot Springs and Wabuska lease areas, both of which are near the Walker River Reservation. These potential adverse environmental justice effects would be mitigated through best management practices and implementation of environmental mitigation measures appropriate for each type of physical disturbance during development.

Geothermal resource development could affect nearby recreational resources, which also could affect the economies of the areas in which the recreational resources are located if fewer visitors use the resources (and spend fewer dollars in the local economy). Increased geothermal activities above current levels could affect revenues associated with the recreational activity (such as bird watching, mountain biking, and hiking) if these activities were reduced or eliminated. As identified in Section 4.8, Recreation, these impacts could include noise and objectionable odors of sulfur from drilling, limiting or preventing access to recreation areas, scaring wildlife away, or causing the loss of recreation areas. Less than significant impacts were identified for most nearby recreational areas, except the California Historic Trail, the Pony Express National Historic Trail, and Grimes Point (which the Salt Wells noncompetitive lease area overlaps), the Humboldt-Toiyabe National Forest in the Bridgeport Ranger District adjacent to the Aurora Crater noncompetitive lease area, and the Mason Valley Wildlife Management Area and east of the California Historic Trail (Sonora Route) near the Wabuska noncompetitive lease area.

As identified in Section 4.9, Grazing, ranchers and shepherds rely on portions of the geothermal leasing areas for grazing their stocks. The level of local economic impact of geothermal leasing activities on grazing would depend on the extent to which reducing the grazing areas would reduce the size or health of a permitee's herds or require that a permitee lease or purchase additional lands. As identified in Section 4.9, Grazing, developing the lease areas could reduce at least 1,780 AUMs distributed throughout the eight grazing allotments that overlap the lease areas. These impacts have been identified

as less than significant percentages of the affected grazing allotments and, therefore, would be unlikely to affect the economic livelihood of ranchers and herders.

Overall, the potential risk for impacts to socioeconomics or environmental justice resulting from geothermal resource development would be low.

Geothermal Resource Production

Impacts due to geothermal production would be similar to those described for development, but at a smaller scale because production involves mainly operation, maintenance, and new well development. Much of the higher levels of construction activity would have occurred during development with the installation of new infrastructure. Once the well field and power plant are operating, about five permanent employees would be needed for field production, and ten additional employees would be needed for each power plant (BLM 2001c).

As with resource development, the physical environmental effects of waste management and disposal and new well development could adversely affect Native American populations on lands adjacent to leasing areas. The most sensitive areas for environmental justice effects would be the Stillwater leasing area, which is adjacent to the Fallon Indian Reservation, and the Lee Hot Springs and Wabuska lease areas, both of which are near the Walker River Reservation. These potential adverse environmental justice effects would be mitigated through best management practices and implementation of environmental mitigation measures appropriate for each type of physical disturbance during production. Overall, the potential risk for impacts to socioeconomics or environmental justice resulting from geothermal resource production would be low.

Closeout

No residents, minority or low-income populations, or businesses would be displaced, and no property would be acquired as a result of the closeout phase of geothermal development. This phase could have a beneficial effect on the surrounding economy. Closeout could involve construction employment for the reclamation of disturbed areas, which could be drawn from both local and nonlocal labor forces. Expenditures for equipment, materials, fuel, lodging, food, and other needs would stimulate the local economy over the duration of the closeout phase. This phase would be unlikely to generate population growth and concentrations or increase the demand for housing in the local area. Best management practices would be used when grading to minimize runoff, fugitive dust, and noise disturbance to adjacent or nearby Native American lands (particularly the Fallon Indian Reservation, adjacent to the Stillwater leasing areas, and the Walker River Reservation, near the Lee Hot Springs and Wabuska lease areas) so that potential adverse environmental justice effects would be avoided. Overall, the potential risk for impacts to socioeconomics or environmental justice resulting from closeout would be low.

4.8 RECREATION

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to recreation. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of the Proposed Action

Leasing land in the KGRAs and noncompetitive lease areas does not involve ground disturbances or changes in population levels; therefore, there would be no direct impact on the use of existing recreational facilities, enjoyment of current recreational opportunities, or construction of recreational facilities.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting recreation is assessed with respect to two significance criteria. Potential impacts to recreation could occur if reasonably foreseeable future actions were to:

- Increase the use of neighborhood and regional parks or other recreational facilities such that facility would substantially deteriorate or that deterioration would be accelerated or
- Diminish the enjoyment of existing recreational opportunities or require the construction of recreational facilities that might have an adverse physical effect on the environment.

The potential risk assessment of indirect impacts affecting recreation from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to recreation in the region of influence. The assessment is described below and is summarized in Table 4-1.

Exploration, development, production, and closeout initiated under a lease agreement should not contribute to any of the geothermal areas a significant number of new residents who could increase the use of existing recreational facilities; therefore, there is a low potential risk of impacts from increasing the use of existing recreational facilities. The following addresses potential impacts to recreation if the project were to diminish

the enjoyment of existing recreational opportunities or require the construction of recreational facilities, which might have an adverse physical effect on the environment.

Steamboat KGRA and Noncompetitive Lease Area

Virginia Foothills Park, which is a Washoe County community park, is approximately three-quarters of a mile north of Section 34 in the Steamboat KGRA. Impacts to recreation at the park from future geothermal activities could include noise and objectionable odors of sulfur from drilling. The potential risk of impacts would be low due to the distance of Section 34 from the park.

Sections of the Steamboat KGRA are on the Humboldt-Toiyabe National Forest in the Carson Ranger District. These sections are isolated from the main forest. Depending on the intensity or frequency of use of these sections for recreation, future geothermal activity could have impacts on recreation, such as hiking, bird watching, nature photography, and mountain biking. Impacts could include limiting/preventing access to recreation areas or loss of recreation areas. The potential risk of impacts would be low if the sections are not intensely or frequently used for recreation. Additionally, in order to address potential impacts to recreation, general stipulations for geothermal resource developers are outlined in Appendix D.

Hazen KGRA and Noncompetitive Lease Area

The Hazen KGRA and noncompetitive lease area overlaps with the Fernley State Wildlife Management Area. Impacts to recreation at the park from future geothermal activities could include noise and objectionable odors of sulfur from drilling, limiting/preventing access to recreation areas, scaring wildlife away, or loss of recreation areas. The potential risk of impacts would be medium if the Fernley State Wildlife Management Area is not intensely or frequently used for recreation. Additionally, general stipulations for geothermal resource developers are outlined in Appendix D in order to address potential impacts to recreation.

Soda Lake KGRA and Noncompetitive Lease Area

No recreation opportunities were identified for the Soda Lake KGRA and noncompetitive lease area, so the potential risk of impacts to recreation from geothermal activity involving exploration, development, production, and closeout would be low.

Stillwater KGRA and Noncompetitive Lease Area

The Stillwater KGRA and noncompetitive lease area overlaps with the Stillwater National Wildlife Refuge and is near the Stillwater WMA. Impacts to recreation in the Stillwater area from future geothermal activities could include noise and objectionable odors of sulfur from drilling, limiting or preventing access to recreation areas, scaring wildlife away, or loss of recreation areas. The potential risk of impacts would be medium if the Stillwater areas are not intensely or frequently used for recreation. Additionally, in order to address potential impacts to recreation, general stipulations for geothermal resource developers are outlined in Appendix D.

Salt Wells KGRA and Noncompetitive Lease Area

The Salt Wells noncompetitive lease area overlaps with the California Historic Trail, the Pony Express National Historic Trail, and Grimes Point. Impacts to recreation at these recreation areas from future geothermal activities could include noise and objectionable odors of sulfur from drilling, limiting/preventing access to recreation areas, or loss of recreation areas. Due to the popularity of the Pony Express National Historic Trail, the potential risk of impacts where the trail crosses the Salt Wells noncompetitive lease area would be high because the trail would be permanently lost if geothermal activity took place on top of it. The trail crosses within approximately two miles of the following sections of the Salt Wells lease area:

- 17N 31E sections 20, 29, 30, 31, 32;
- 17N 30 E Section 25, 26, 27, 28 32, 33, 34, 35, 36;
- 16N 31E Section 6 and 7; and
- 16N 30E Section 1, 2, 3, 4, 9 10, 11, and 12.

The potential risk of impacts to geothermal lease areas occupied by Grimes Point would also be high because of its popularity as a recreation site. Sections within two miles of Grimes Point include the following 18N 30E sections 19, 20, 28, 29, 30, 31, 32, and 33 (BLM undated).

The potential risk of impacts on the remaining areas would be medium because of the proximity of various recreational opportunities to geothermal areas. In order to address potential impacts to recreation, general stipulations for geothermal resource developers are outlined in Appendix D.

Lee Hot Springs Noncompetitive Lease Area

The Lee Hot Springs noncompetitive lease area is south the Pony Express National Historic Trail. Impacts to recreation at this recreation area from future geothermal activities could include noise and objectionable odors of sulfur from drilling, limiting or preventing access to recreation areas, or loss of recreation areas. The potential risk of impacts would be medium for the noncompetitive lease areas closest to the trail (16N 29E, sections 19, 20, 21, 22, and 23). The potential risk of impacts to the remaining area would be low, if this recreation area were not intensely or frequently used for recreation. Additionally, in order to address potential impacts to recreation, general stipulations for geothermal resource developers are outlined in Appendix D.

Aurora Crater Noncompetitive Lease Area

The Aurora Crater noncompetitive lease area is on the edge of the Humboldt-Toiyabe National Forest in the Bridgeport Ranger District. Impacts to recreation at this recreation area from future geothermal activities could include noise and objectionable odors of sulfur from drilling, limiting or preventing access to recreation areas, or loss of recreation areas. The potential risk of impacts would be high because the geothermal area is in a national forest where diverse and numerous forms of recreation take place.

In order to address potential impacts to recreation, general stipulations for geothermal resource developers are outlined in Appendix D.

Wabuska Noncompetitive Lease Area

The Wabuska noncompetitive lease area is just north of Mason Valley Wildlife Management Area and east of the California Historic Trail (Sonora Route). Impacts to recreation at this recreation area from future geothermal activities could include noise and objectionable odors of sulfur from drilling, limiting or preventing access to recreation areas, scaring wildlife away, or loss of recreation areas. The potential risk of impacts would be medium because of the proximity of various recreational opportunities to geothermal areas. In order to address potential impacts to recreation, general stipulations for geothermal resource developers are outlined in Appendix D.

4.9 GRAZING RESOURCES

Impacts on grazing resources are calculated by assuming that maximum reasonable development of a lease area would disturb roughly 70 acres per section as a result of construction of wells, well pads, access roads, power plants, and transmissions lines (see Appendix C, Reasonable Development Scenario). Grazing would be limited by construction of fencing and loss of access to vegetation.

Direct Impacts of the Proposed Action

The proposed leasing would not have any direct impact on grazing activities in the lease areas.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting grazing resources is assessed with respect to one significance criteria: Potential impacts to grazing resources could occur if reasonably foreseeable future actions resulted in a loss of more than 10 percent of the AUMs supported by a given allotment.

The potential risk assessment of indirect impacts affecting grazing resources from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—If there were significant impacts on the above criteria;
- Medium—If there were moderate impacts on the above criteria; and
- Low—If there were minor or no impacts on the above criteria.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to grazing resources in the region of influence. The assessment is described below and is summarized in Table 4-1.

The exploration, development, production, and closeout that may occur as a result of geothermal leasing may adversely affect the quality of grazing resources in the lease areas. Development of the lease areas could result in a reduction of at least 1,780 AUMs distributed through the eight grazing allotments that overlap the lease areas. Under BLM regulations, grazing allotment permits are held subject to other uses of the public lands. If BLM approves other (nonemergency) uses that would limit grazing within allotments, the BLM gives the permit holders two years notice of a reduction in the allotment. If a reduction is sufficiently minor—for example, if it would reduce the number of AUMs in an allotment only by a small amount—then the BLM may unilaterally issue a grazing decision.

These potential indirect impacts from developing lease areas are discussed more specifically by each lease area. Table 4.9-1 provides a breakdown of allotments and the lease areas they overlap, along with the percentages of AUMs within the lease areas.

Table 4.9-1
Grazing Allotment Data for Allotments in the ROI of the Proposed Leasing Areas

Lease Area	Overlapping Allotment	Grazing Preference (AUMs)	Total Acreage	Approximate Acres of Allotment within Leasing Areas	Approximate AUMs within Lease Areas	Acres per AUM
Aurora Crater	Nine Mile	2,290	25,665	1,898	169	11
Aurora Crater	USFS Nine Mile	N/A	54,209	642	N/A	N/A
Aurora Crater	USFS Powell Mountain	N/A	62,603	1	N/A	N/A
Aurora Crater	USFS Aurora	N/A	25,790	1,129	N/A	N/A
Hazen	Truckee-Virginia	1005	21,369	587	28	21
Hazen	Reclamation allotment	400	7,680	3,840	200	19
Lee Hot Springs	Bass Flat	1,598	46,789	1,071	35	29
Lee Hot Springs	Horse Mountain	3,000	63,043	13,471	641	21
Soda Lake	Reclamation allotments	N/A		15,000	N/A	N/A
Salt Wells	Bass Flat	1,598	46,789	7,203	246	29
Salt Wells	Rock Springs	535	28,394	14,558	274	53
Salt Wells	Salt Wells	1,940	58,611	1,018	33	30
Salt Wells	Reclamation allotments	N/A	4,500+	1,300	N/A	N/A
Steamboat	Jumbo	1,395	19,978	1,773	124	14
Wabuska	Adriance Valley	1,620	31,790	6,407	326	19

Source: BLM 2002 (Summaries of Grazing Leases, Carson City Management Area)

Steamboat KGRA and Noncompetitive Lease Area

Approximately 1,773 acres of the Jumbo Grazing Allotment overlap with the Steamboat KGRA. If in the future the Steamboat KGRA is fully developed, this would result in the disturbance and loss of access to approximately 195 grazing acres of that overlapping area. Complete development of Steamboat KGRA could in the long-term result in the loss of up to 14 AUMs, or one percent of the Jumbo AUMs. The potential risk for impacts to grazing resources would be low.

Hazen KGRA and Noncompetitive Lease Area

Approximately 587 acres of the Truckee-Virginia Grazing Allotment overlap with the Hazen KGRA and Noncompetitive Lease Area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 65 grazing acres of that overlapping area. Complete development of the Hazen lease area could in the long term result in the loss of up to three AUMs, or less than one percent of the Truckee-Virginia AUMs. Approximately 3,840 acres of Reclamation grazing allotment overlap this lease area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 422 grazing acres of

that overlapping area. Complete development of the lease area could result in a loss of up to 22 AUMs on the Reclamation allotment. The potential risk for impacts to grazing resources would be low.

Soda Lake KGRA and Noncompetitive Lease Area

Approximately 15,000 acres of a set of Reclamation grazing allotments overlap this lease area. Full development of this lease area could result in a loss of access to grazing resources on 1,650 acres of a total of more than 319,000 acres in the allotments.

The potential risk for impacts to grazing resources would be low.

Stillwater KGRA

The potential risk for impacts to grazing resources would be low.

Salt Wells KGRA and Noncompetitive Lease Area

Approximately 1,018 acres of the Salt Wells Grazing Allotment overlap with the Salt Wells KGRA and Noncompetitive Lease Area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 112 grazing acres of that overlapping area. Development of these overlapping sections could in the long term result in the loss of up to four AUMs, or less than one percent, of the Salt Wells AUMs.

Approximately 14,558 acres of the Rock Springs Grazing Allotment overlap with the Salt Wells KGRA and Noncompetitive Lease Area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 1,600 grazing acres of that overlapping area. Development of these overlapping sections could in the long term result in the loss of up to 30 AUMs, or approximately five percent of the Rock Springs AUMs.

Approximately 6,128 acres of Bass Flat Grazing Allotment overlap this lease area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 674 grazing acres of that overlapping area. Development of these overlapping sections could in the long term result in the loss of up to 23 AUMs, or less than two percent of the Bass Flat AUMs.

Approximately 1,300 acres of a set of Reclamation grazing allotments overlap this lease area. Full development of this lease area could result in a loss of access to grazing resources on 143 acres of a total of more than 4,500 acres in the allotments.

The potential risk for impacts to grazing resources would be low.

Lee Hot Springs Noncompetitive Lease Area

Approximately 13,471 acres of Horse Mountain Grazing Allotment overlap with the Lee Hot Springs Noncompetitive Lease area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 1,480 grazing acres of that overlapping area. Complete development of these

overlapping sections could in the long term result in the loss of up to 70 AUMs, or 2.3 percent of the Horse Mountain AUMs.

Approximately 1,071 acres of Bass Flat overlap this lease area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 118 grazing acres of that overlapping area. Development of these overlapping sections could in the long term result in the loss of up to four AUMs, or less than one percent of the Bass Flat AUMs.

The potential risk for impacts to grazing resources would be low.

Aurora Crater Noncompetitive Lease Area

Approximately 1,898 acres of Nine Mile Grazing Allotment and 1,772 acres of the USFS Nine Mile, Aurora, and Powell Mountain grazing allotments overlap with the Aurora Crater Noncompetitive Lease Area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 404 grazing acres of that overlapping area. Complete development of these overlapping sections could in the long term result in the loss of up to 19 AUMs, or less than one percent, of the BLM Nine Mile allotment AUMs. The impact on the USFS allotments would be measured in potential loss of, at most, 195 acres from a total allotment area of 142,602 acres.. The potential risk for impacts to grazing resources would be low.

Wabuska Noncompetitive Lease Area

Approximately 6,407 acres of Adriance Valley Grazing Allotment overlap with the Wabuska Noncompetitive Lease Area. If in the future this area were fully developed, this would result in the disturbance and loss of access to approximately 705 grazing acres of that overlapping area. Complete development of these overlapping sections could in the long term result in the loss of up to 37 AUMs, or approximately two percent of the Adriance Valley AUMs. The potential risk for impacts to grazing resources would be low.

4.10 WILDERNESS STUDY AREAS

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to WSAs. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario. The project would have a significant impact if it were to adversely affect the quality of the environment, either within or surrounding a WSA, which could cause a WSA to be removed from consideration as wilderness.

Direct Impacts of the Proposed Action

The proposed action would have no direct impact on the quality of the environment, either within or surrounding the Job Peak or Stillwater Range WSAs. Leasing land in the Stillwater KGRA does not involve ground disturbances and therefore would not directly affect the quality of the environment, either within or surrounding these WSAs.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting a WSA is assessed with respect to one significance criteria: Potential impacts to visual resources could occur if reasonably foreseeable future actions have adverse effects on a WSA's wilderness qualities.

The potential risk assessment of indirect impacts affecting a WSA from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—The risk of potential indirect impacts would be high if significant impacts to the above criteria occurred during exploration, development, production, or closeout;
- Medium—The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, or closeout; and
- Low—The risk of potential indirect impacts would be low if minor or no impacts to the above criteria occurred during exploration, development, production, or closeout.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to a WSA in the region of influence. The assessment is described below and summarized in Table 4-1.

The exploration, development, production, and closeout that may occur as a result of geothermal leasing may adversely affect the quality of the environment, either within or surrounding the Job Peak or Stillwater Range WSAs; however, these WSAs are not recommended for wilderness. There is a low risk of the proposed action's reasonable development scenario activities affecting the quality of the environment either within or surrounding these WSAs.

4.11 AIR QUALITY

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to visual resources. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of the Proposed Action

The proposed action would have no direct impacts to air quality. The leasing of land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities, construction, or other activities that would produce air pollutant emissions. Since most of the proposed lease areas are not within nonattainment areas, Clean Air Act conformity requirements do not apply. The four proposed lease parcels within nonattainment areas would not generate emissions above de minimis levels; therefore, the requirements of the EPA general conformity rule are not applicable to lease actions within these areas.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting air resources is assessed with respect to three significance criteria. Potential impacts to air resources could occur if any of the following were to take place:

- Reasonably foreseeable future actions conflict with or obstruct implementation of the applicable air quality attainment plan;
- Reasonably foreseeable future actions violate any stationary source air quality standard or contribute to an existing or projected air quality violation; or
- Reasonably foreseeable future actions expose sensitive receptors (e.g., concentrations of children, elderly, or persons with respiratory conditions) to major pollutant concentrations.

The potential risk assessment of indirect impacts affecting air resources from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—The risk of potential indirect impacts would be high if significant impacts to the above criteria occurred during exploration, development, production, or closeout;
- Medium—The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, or closeout; and
- Low—The risk of potential indirect impacts would be low if minor or no impacts to the above criteria occurred during exploration, development, production, or closeout.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to air resources in the region of influence. The assessment is described below and summarized in Table 4-1.

Steamboat KGRA and Noncompetitive Lease Area

Future exploration, development, and production could involve new structures, roads, and operations described in Appendix C, Reasonable Development Scenario. Temporary construction-related emissions would result from ground-disturbing activities, construction vehicle exhaust emissions, diesel generator and power tool use, and worker vehicle emissions. Operational emissions could include venting of hydrogen sulfide from the wells, localized fogging around the wells, and slight heating of the local atmosphere. Implementing standard lease stipulations would reduce fugitive dust emissions during construction; additional measures to reduce fugitive dust could be included as a requirement of development plans. A formal Clean Air Act conformity determination would be required if actions at the lease sites in nonattainment areas were to result in emissions greater than 100 tons per year of carbon monoxide, 70 tons per year of PM_{10}, and 100 tons per year of ozone precursor emissions (NOx and ROG). It is unlikely that geothermal development and operations would result in emissions of this magnitude. The risk for potentially significant impacts to air resources would be low.

Hazen KGRA and Noncompetitive Lease Area, Soda Lake KGRA and Noncompetitive Lease Area, Stillwater KGRA, Salt Wells KGRA and Noncompetitive Lease Area, Lee Hot Springs Noncompetitive Lease Area, Wabuska Noncompetitive Lease Area, and Aurora Crater Noncompetitive Lease Area

Future exploration, development, and production could involve new structures, roads, and operations described in Appendix C, Reasonable Development Scenario. Temporary construction-related emissions would result from ground-disturbing activities, construction vehicle exhaust emissions, diesel generator and power tool use, and worker vehicle emissions. Operational emissions could include venting of hydrogen sulfide from the wells, localized fogging around the wells, and slight heating of the local atmosphere. Implementing standard lease stipulations would reduce fugitive dust emissions during construction; additional measures to reduce fugitive dust could be included as a requirement of development plans. These lease areas are not within nonattainment areas; therefore, Clean Air Act conformity requirements do not apply. The risk for potentially significant impacts to air resources would be low.

4.12 WILD HORSES AND BURROS

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions to wild horses and burros. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of Proposed Action

The proposed action would have no direct impact on the horses within the Lahontan HMA. Leasing land in the Wabuska noncompetitive lease area does not involve ground disturbances and therefore would affect neither the habitat nor the movement of the horses within the Lahontan HMA.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts affecting HMAs is assessed with respect to two significance criteria. Potential impacts to visual resources could occur if any of the following were to take place:

- Reasonably foreseeable future actions were to have an adverse effect on the habitat of wild horses and burros, or
- Reasonably foreseeable future actions were to interfere with the movement of wild horses and burros.

The potential risk assessment of indirect impacts affecting HMAs from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—The risk of potential indirect impacts would be high if significant impacts to the above criteria occurred during exploration, development, production, or closeout;
- Medium—The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, or closeout; and
- Low—The risk of potential indirect impacts would be low if minor or no impacts to the above criteria occurred during exploration, development, production, or closeout.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts to HMAs in the region of influence. The assessment is described below and summarized in Table 4-1.

Based on the reasonable development scenario, the proposed action is expected to have a low risk of potentially significant impacts on the habitat of horses within the Lahontan HMA. Due to the distance (approximately six miles) of the HMA from the Wabuska noncompetitive lease area, exploration, development, production, and closeout would not affect the quality of the habitat in the HMA.

Although the Lahontan HMA is approximately six miles north of the Wabuska noncompetitive lease area, exploration, development, production, and closeout may involve activities that could overlap with and affect the movement of both Lahontan HMA horses and other horses that use the HMA or interact with its horses. Impacts could include altering the travel routes or grazing grounds of the horses due to activities and noises associated with exploration, development, production, and closeout. The risk of potentially significant impacts to the movement of horses is expected to be low.

4.13 HAZARDOUS MATERIALS

This section analyzes direct impacts from the proposed action and indirect impacts from reasonably foreseeable future actions involving hazardous materials. Reasonably foreseeable future actions are discussed in Appendix C, Reasonable Development Scenario.

Direct Impacts of the Proposed Action

Leasing land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction; therefore, there would be no direct impact from hazardous materials. In addition, preliminary exploration (mapping and geochemical sampling) does not cause appreciable impacts on resources.

Indirect Impacts of Future Actions Based on Reasonable Development Scenario

Future actions based on the reasonable development scenario could result in indirect impacts. The potential risk of these indirect impacts involving hazardous materials is assessed with respect to four significance criteria. Potential impacts to involving hazardous materials could occur if any of the following were to take place:

- Reasonably foreseeable future actions create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Reasonably foreseeable future actions create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Reasonably foreseeable future actions emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; or
- Reasonably foreseeable future actions were located on a site which is included on a list of hazardous materials sites compiled by the Federal or state government and, as a result, would it create a hazard to the public or the environment.

The potential risk assessment of indirect impacts involving hazardous materials from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High—The risk of potential indirect impacts would be high if significant impacts to the above criteria occurred during exploration, development, production, or closeout;
- Medium—The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, or closeout; and

- Low—The risk of potential indirect impacts would be low if minor or no impacts to the above criteria occurred during exploration, development, production, or closeout.

The actual level of impact would depend on the extent of geothermal resource development. This high-to-low scale is used to assess the potential risk of future indirect impacts involving hazardous materials in the region of influence. The assessment is described below and summarized in Table 4-1.

KGRAs and Noncompetitive Lease Areas

Future exploration, development, production, and closeout would involve hazardous materials at the KGRAs, noncompetitive lease areas, and geothermal infrastructures, such as a power plant or pipeline route. These materials would include, but not be limited to, the use of drilling additives and mud, diesel fuel, lubricants, solvents, oil, equipment/vehicle emissions, geothermal water, and laboratory materials. The transport, use, or disposal of hazardous materials could have less-than-significant impacts to workers, the public, and the environment. Accidental spills and emissions could also have less-than-significant impacts. The level of impact would depend on the training, experience, and knowledge of geothermal developers and site workers to properly manage hazardous materials. General stipulations for geothermal resource developers and site workers are outlined in Appendix D in order to address the potential impacts involving hazardous materials. The risk for potentially significant impacts involving hazardous materials would be low.

4.14 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, no geothermal lease applications would be approved or offered, so no direct impacts would occur. The decision not to lease federal lands for geothermal development could have indirect effects as a result of increased development on private lands. Development on private lands could carry over onto public lands that are in close proximity.

4.15 MITIGATING MEASURES

In order to reduce or eliminate adverse impacts associated with geothermal leasing and subsequent exploration, development, operation, and closure, several levels of mitigating measures may be applied. During the leasing phase, stipulations may be added that address known resource concerns in the lease areas. Lease stipulations have been developed to address general and site-specific resource concerns raised in the analysis in the EA and are presented in Appendix D. Additional stipulations may be included as part of the final lease agreement.

In addition to the lease stipulations, BLM approval of subsequent ground-disturbing activities undertaken during exploration, development, operation, or closeout, would include SPPs and COAs to address specific resource concerns. SPPs and COAs that may be applied to subsequent activities are presented also in Appendix D.

4.16 RESIDUAL IMPACTS

The proposed leasing action would have no impacts, so no residual impacts would remain. Subsequent exploration and development of geothermal resources would result in ground disturbance, but no significant residual impacts would be expected to remain after closeout and required reclamation of all disturbed areas.

4.17 CUMULATIVE IMPACTS

CEQ regulations state that the cumulative impact analysis should include the anticipated impacts to the environment resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time" (40 CFR 1508.7).

Impacts of the proposed action and alternatives presented in this EA are assessed for cumulative impacts with other actions conducted in the region. Unless otherwise specified, the region of influence for each resource in the cumulative analysis is the same as the area defined in Chapter 3.

This analysis considers the effects of the proposed action, as evaluated in detail in Chapter 4, when combined with the effects of other past, present, and future actions in the affected region. Since the proposed action is only issuance of leases and involves no ground-disturbing activities, no direct impacts would occur that would contribute to cumulative conditions in the affected area. Cumulative actions evaluated in this section include subsequent geothermal development actions described in the reasonable

development scenario (Appendix C), other proposed land actions and use of those lands, and other reasonably foreseeable future actions.

Current or reasonably foreseeable actions that have been identified are described below. No specific cumulative projects were identified for the lease areas in Mineral and Lyon counties. Cumulative projects were identified in Churchill and Washoe counties and are discussed further below. It is assumed that, because of the geographic extent of the proposed leasing, a large number of small land status changes, such as rights-of-way or mineral claims, would occur throughout the area. While is not feasible to identify each of these potential activities throughout the entire lease area, these activities could contribute to cumulative impacts and are considered in a general manner in the analysis below.

Geothermal Development. Twenty-nine geothermal power plants are operating in the United States, 12 of which are in Nevada; seven of these plants are in the CCFO management area. There are currently approximately 140 noncompetitive lease applications for geothermal development pending in the State of Nevada, 57 of which are within the CCFO management area. There are also 14 KGRAs within Nevada, each of which contains land that may be offered for geothermal leasing. Eight of the KGRAs are within the CCFO management area. Other field offices within the State are proceeding with processing of competitive and noncompetitive leases within their respective areas of administration. Although no detailed proposals have been developed, geothermal development is being considered on private, tribal, and other federal land (US Navy) throughout the CCFO management area.

Expansion of Stillwater NWR. The USFWS is proposing to expand the Stillwater NWR. Under USFWS preferred alternative, the refuge would be expanded to include most of the lands that are currently part of the Stillwater NWR and Stillwater WMA. The boundary between the refuge and the Stillwater KGRA to the east would be remain the same, however, the refuge boundary to the north, which currently abuts the KGRA, would be shifted by approximately 1 mile to the north from the KGRA boundary. Other federal and nonfederal inholdings within the refuge would be reduced. The Draft EIS for this action was published in March 2000.

Carson Lake Pastures. Under the Truckee-Carson-Pyramid Lake Water Rights Settlement Act, Pub. L. 101-618, the Secretary of the Interior was authorized to convey Reclamation withdrawn lands in the area referred to as the "Carson Lake and Pasture" to the State of Nevada for use as a State wildlife refuge. While the agreement has not been completed, the State of Nevada and Reclamation regard the conveyance as an active proposal that will be completed at an unspecified date.

Interstate 580 (I-580). Redevelopment of I-580 in Washoe County has been a work in progress since 1957. The Nevada Department of Transportation (NDOT) is in the beginning phases of implementing the I-580 alignment between the Mt. Rose Highway and the Bowers Mansion cutoff. The freeway will run parallel to and replace the current US 395. The proposed section of freeway will span eight and a half miles and be divided

up into two phases (phase A and B). Phase A construction set to begin in the spring of 2003 and last three years. Construction of Phase B is set to begin in the spring of 2005 and predicted to finish in 2007.

B-19 Target Development. The Navy developed additional targets at the B-19 range to meet training requirements.

Other Power Projects. Two power projects are being considered in Washoe County; a diesel plant west of Highway 395 in southern Washoe County and a coal fired plant near Wadsworth, east of Reno along the border with Lyon County. Both projects are conceptual and further details are not available at this time.

4.17.1 Direct Cumulative Impacts of the Proposed Action

The leasing of land in the KGRAs and noncompetitive lease areas does not involve ground-disturbing activities or any type of construction, so the proposed action would not contribute to cumulative impacts to any resource areas.

4.17.2 Cumulative Impacts Based on Reasonable Development Scenario and Other Actions

Land Use

The proposed action could indirectly contribute to cumulative impacts from incompatibility with surrounding uses. Subsequent geothermal development activities in combination with other residential development and construction of the I-580 extension in the Steamboat area could result in cumulatively significant changes in land use patterns in this area. These impacts would likely be addressed through lease stipulations (Appendix E) and subsequent approvals for geothermal development by BLM or special use permitting by the counties. No adverse cumulative impacts to land use would occur.

Soils, Geology, and Minerals

The cumulative indirect effects of the project on soils, seismicity, and exploration and production of mineral resources are expected to be generally less than significant, provided that construction and operation of geothermal facilities is in compliance with building codes, and state and local permit requirements.

Water Resources

Surface Water. None of the potential surface water impacts described above is expected to contribute significantly, either directly or indirectly, to a cumulative impact on surface water in any of the lease areas under consideration.

Groundwater. Geothermal leasing in most areas would not be expected to contribute directly or indirectly to a cumulative impact on groundwater quality of quantity. Any added use of or discharge to groundwater in the Steamboat area, where demand for potable water is nearing the available supply, could contribute to cumulative impacts to groundwater.

Cultural Resources and Native American Concerns

Development of geothermal lease areas throughout the state of Nevada has the potential to affect cultural and Native American resources. Geothermal Lease areas that contain significant cultural resources that may be adversely affected by future leasing and geothermal development may be mitigated through data recovery or other appropriate recording measures reducing these impacts to less than significant. An exception may be in areas where the settings for historic trails or other historic corridors would be altered thereby affecting the qualities that make the segments eligible for the NRHP. Significant Native American resources have already been negatively affected by geothermal development, and because these resources are finite and cannot be mitigated, future development would likely result in significant adverse affects to Native American Resources.

Biological Resources

Wildlife, Fisheries, and Migratory Birds/Special Status Wildlife Species/Vegetation and Noxious Weeds. The proposed action would have no direct impacts to biological resources. Geothermal development in certain areas where sensitive resources are found, such as the Steamboat (i.e., deer habitat, Buckwheat) or the Aurora Crater area (i.e., sage grouse habitat) may, in combination with other actions throughout the area, result in cumulatively significant impacts to these biological resources. These impacts would likely be addressed through subsequent approvals for geothermal development by BLM or special use permitting by the counties. No adverse cumulative impacts to biological resources would occur.

Visual Resources

Cumulative impacts to visual resources in the Steamboat KGRA and noncompetitive lease area would be high. The Steamboat KGRA and noncompetitive lease area already have some commercial and residential development nearby. The additional structures and activities from cumulative actions within these areas would further diminish the aesthetics of the interface between urban and open space lands.

Due to the expansive nature of the visual environment and minimal development in geothermal lease areas in the Great Basin, cumulative impacts from development could be significant. Cumulative impacts could be significant, because geothermal development (discussed above) in addition to the proposed action's indirect activities (discussed in Appendix C) could add a significant number of new industrial structures and activities in areas that are fairly undeveloped. Also, geothermal development in Stillwater wildlife areas, Carson Lake Pastures, and Aurora Crater would represent significant visual impacts to areas preserved for natural processes.

Socioeconomics

The overall economic effect of geothermal leasing and the subsequent reasonable development scenario would be a positive stimulus to the economy of the local area surrounding the geothermal resource. Potential environmental justice effects to adjacent or nearby Native American populations would be avoided through best management practices and implementation of environmental mitigation measures appropriate for

each type of physical disturbance. In combination with other future planned development, potential adverse effects due to the proposed geothermal leasing program would be less than significant.

Recreation

Most of the indirect impacts to recreation from the proposed action involve possible access limitations to recreation areas, scaring wildlife away, and reducing overall recreational enjoyment, such as diminishing the visual qualities of recreation areas/adjacent land and creating disagreeable odors (i.e. hydrogen sulfide odors). The Stillwater wildlife areas and Carson Lake Pastures would be subject to these impacts, because these areas could be used for wildlife viewing and nature photography. The proposed action in conjunction with the other projects described above would continue to diminish recreation enjoyment and activities in the geothermal lease areas. These cumulative impacts could be significant, depending on the amount of geothermal development and amount of coordination among different geothermal developers to limit unnecessary construction and activity.

Grazing

Proposed geothermal leasing and the expansion of the Stillwater NWR may have a minor indirect impact on grazing allotments in the future. However the areas of grazing exclusion on lands leased for mineral exploration are generally small relative to the size of the allotments; therefore livestock numbers are not expected to be reduced significantly as a result of geothermal development. Expansion of the Stillwater NWR may have a minor impact on grazing resources, depending upon the size of the expansion and on whether there are grazing allotments within the expansion area.

WSAs

There are no WSAs in the area of the proposed action.

Air Quality

The proposed action would not result in significant regional air quality concerns. Other actions occurring on public lands, in combination with the proposed action, release low levels of air emissions, dispersed over large and sparsely populated areas. The resulting pollutant concentrations tend to be low, with limited fluctuations in air quality. Geothermal development in the Steamboat area, where most air quality problems in Nevada are confined, could contribute minor construction and operation emissions to the federal nonattainment conditions in these areas. The proposed action would not substantially increase pollutant emissions in Nevada; therefore, no cumulative impacts are expected.

Wild Horses and Burros

Cumulative impacts to wild horses and burros from geothermal leasing would be less than significant because the only HMA in the vicinity of potential lease areas (Lahontan HMA) is more than six miles from a proposed lease area, wild horses and burros do not occur within the lease area, and no other cumulative actions in the area are known that would affect wild horses or burros.

Hazardous Materials

Each phase of the proposed action's indirect activities (discussed in Appendix C) could involve hazardous materials. This would also be true for other geothermal development projects. As the amount of activity in an area increases, the likelihood of an accident, such as a collision involving a vehicle transporting hazardous material, increases. Cumulative impacts are not expected to be significant, however, because of the various regulations and requirements associated with using, transporting, storing, and disposing of hazardous materials.

4.18 MONITORING

No monitoring needs have been identified for this action because leasing would not authorize any ground-disturbing activities that could affect environmental resources.

Table 4-1
Environmental Risk Levels for Proposed Lease Areas

LEASE AREAS				ENVIRONMENTAL RESOURCE RISK BY RESOURCE													
Township / Range	Section	Lease Applicant	Serial Number	Air	Water	Land	Recreation	Visual	Biology	Wild Horse and Burro	Geology / Soils	Grazing	WSAs	Native American Concerns	Cultural Resources	Hazardous Materials	Socioeconomics
Steamboat KGRA and Noncompetitive Lease Area																	
18N 19E	36	KGRA		L	M	**H**	L	M	**H**	L	L	L	L	**H**	**H**	L	L
18N 20E	34	KGRA		L	M	**H**	L	M	**H**	L	L	L	L	**H**	**H**	L	L
17N 19E	12	EVERGREEN ENERGY	NVN 074884	L	M	**H**	L	M	**H**	L	L	L	L	**H**	**H**	L	L
17N 20E	6	KGRA		L	M	**H**	L	M	**H**	L	L	L	L	**H**	**H**	L	L
17N 20E	8	EVERGREEN ENERGY	NVN 074884	L	M	**H**	L	M	**H**	L	L	L	L	**H**	**H**	L	L
Hazen KGRA and Noncompetitive Lease Area																	
20N 25E	2	KGRA		L	L	**H**	M	M	M	L	L	L	L	**H**	M	L	L
	10	KGRA		L	L	**H**	M	M	M	L	L	L	L	**H**	M	L	L
	12	KGRA		L	L	**H**	M	M	M	L	L	L	L	**H**	M	L	L
	14	KGRA		L	L	**H**	M	M	M	L	L	L	L	**H**	M	L	L
	24	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
20N 26E	4	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	6	KGRA		L	L	**H**	M	M	M	L	L	L	L	**H**	M	L	L
	8	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	10	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	16	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	18	KGRA		L	L	**H**	M	M	M	L	L	L	L	**H**	M	L	L
	20	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	22	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	28	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	30	KINGZETT JAMES M	NVN 075005	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
Soda Lake KGRA and Noncompetitive Lease Area																	
19N 27E	2	HENKLE AND ASSOCIATES	NVN 075817	L	L	L	L	M	M	L	L	L	L	M	M	L	L
19N 28E	2	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	3	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	4	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	6	HENKLE AND ASSOCIATES	NVN 075816	L	L	L	L	M	M	L	L	L	L	M	M	L	L
	8	HENKLE AND ASSOCIATES	NVN 075816	L	L	L	L	M	M	L	L	L	L	M	M	L	L
	10	HENKLE AND ASSOCIATES	NVN 075816	L	L	L	L	M	M	L	L	L	L	M	M	L	L
20N 27E	36	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
20N 28E	2	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	4	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	8	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	10	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L

LEASE AREAS				ENVIRONMENTAL RESOURCE RISK BY RESOURCE													
Township / Range	**Section**	**Lease Applicant**	**Serial Number**	**Air**	**Water**	**Land**	**Recreation**	**Visual**	**Biology**	**Wild Horse and Burro**	**Geology / Soils**	**Grazing**	**WSAs**	**Native American Concerns**	**Cultural Resources**	**Hazardous Materials**	**Socioeconomics**
	12	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	14	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	16	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	18	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	24	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	25	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	26	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	35	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	36	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
20N 29E	27	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	28	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	29	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	30	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	31	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	32	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	33	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	34	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
21N 28E	24	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	26	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	34	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
	36	KGRA		L	L	L	L	M	M	L	L	L	L	M	M	L	L
Stillwater KGRA																	
19N 30E	5	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	25	KGRA		L	L	M	M	M	M	L	L	L	L	**H**	**H**	L	L
	26	KGRA		L	L	M	M	M	M	L	L	L	L	**H**	**H**	L	L
	35	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	36	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
20N 30E	35	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
Salt Wells KGRA and Noncompetitive Lease Area																	
16N 30E	1	VULCAN ENERGY	NVN 066737	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	1	NGP POWER CORP	NVN 074723	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	2	VULCAN ENERGY	NVN 066737	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	2	NGP POWER CORP	NVN 074723	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	3	VULCAN ENERGY	NVN 066737	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	3	NGP POWER CORP	NVN 074723	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	4	NGP POWER CORP	NVN 074717	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	9	NGP POWER CORP	NVN 074717	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	10	NGP POWER CORP	NVN 074718	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	11	NGP POWER CORP	NVN 074718	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L

LEASE AREAS				ENVIRONMENTAL RESOURCE RISK BY RESOURCE														
Township / Range	Section	Lease Applicant	Serial Number	Air	Water	Land	Recreation	Visual	Biology	Wild Horse and Burro	Geology / Soils	Grazing	WSAs	Native American Concerns	Cultural Resources	Hazardous Materials	Socioeconomics
	12	NGP POWER CORP	NVN 074718	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
16N 31E	6	NGP POWER CORP	NVN 074714	L	L	L	**H**	M	M	L	L	L	L	M	M	L	L
	7	NGP POWER CORP	NVN 074714	L	L	L	**H**	M	M	L	L	L	L	M	M	L	L
17N 30E	1	NGP POWER CORP	NVN 074706	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	2	NGP POWER CORP	NVN 074706	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	3	NGP POWER CORP	NVN 074706	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	4	NGP POWER CORP	NVN 074706	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	5	NGP POWER CORP	NVN 074707	L	L	M	M	M	M	L	L	L	L	**H**	**H**	L	L
	8	NGP POWER CORP	NVN 074707	L	L	M	M	M	M	L	L	L	L	**H**	**H**	L	L
	9	NGP POWER CORP	NVN 074708	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	10	NGP POWER CORP	NVN 074708	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	11	NGP POWER CORP	NVN 074708	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	12	NGP POWER CORP	NVN 074708	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	13	NGP POWER CORP	NVN 074709	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	14	NGP POWER CORP	NVN 074709	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	15	VULCAN ENERGY	NVN 066738	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	15	NGP POWER CORP	NVN 074721	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	16	NGP POWER CORP	NVN 074709	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	17	NGP POWER CORP	NVN 074709	L	L	M	M	M	M	L	L	L	L	**H**	**H**	L	L
	20	NGP POWER CORP	NVN 074709	L	L	M	M	M	M	L	L	L	L	**H**	**H**	L	L
	21	NGP POWER CORP	NVN 074710	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	22	VULCAN ENERGY	NVN 066738	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	22	NGP POWER CORP	NVN 074721	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	23	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	24	KGRA		L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	25	KGRA		L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	26	KGRA		L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	27	VULCAN ENERGY	NVN 066738	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	27	NGP POWER CORP	NVN 074721	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	28	NGP POWER CORP	NVN 074711	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	29	NGP POWER CORP	NVN 074711	L	L	M	M	M	M	L	L	L	L	**H**	M	L	L
	32	NGP POWER CORP	NVN 074711	L	L	M	**H**	M	M	L	L	L	L	**H**	M	L	L
	33	NGP POWER CORP	NVN 074712	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	34	VULCAN ENERGY	NVN 066738	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	34	NGP POWER CORP	NVN 074722	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	35	VULCAN ENERGY	NVN 066739	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	35	NGP POWER CORP	NVN 074722	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	36	VULCAN ENERGY	NVN 066739	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	36	NGP POWER CORP	NVN 074722	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L

LEASE AREAS				ENVIRONMENTAL RESOURCE RISK BY RESOURCE														
Township / Range	**Section**	**Lease Applicant**	**Serial Number**	**Air**	**Water**	**Land**	**Recreation**	**Visual**	**Biology**	**Wild Horse and Burro**	**Geology / Soils**	**Grazing**	**WSAs**	**Native American Concerns**	**Cultural Resources**	**Hazardous Materials**	**Socioeconomics**
17N 31E	20	HENKLE AND ASSOCIATES	NVN 075609	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	29	HENKLE AND ASSOCIATES	NVN 075815	L	L	L	**H**	M	M	L	L	L	L	**H**	M	L	L
	30	NGP POWER CORP	NVN 074713	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	31	NGP POWER CORP	NVN 074713	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	32	HENKLE AND ASSOCIATES	NVN 075815	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
18N 30E	19	NGP POWER CORP	NVN 074715	L	L	M	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	20	NGP POWER CORP	NVN 074715	L	L	M	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	28	NGP POWER CORP	NVN 074716	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	29	NGP POWER CORP	NVN 074715	L	L	M	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	30	NGP POWER CORP	NVN 074715	L	L	M	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	31	NGP POWER CORP	NVN 074716	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	32	NGP POWER CORP	NVN 074716	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	33	NGP POWER CORP	NVN 074716	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
Lee Hot Springs Noncompetitive Lease Area																		
15N 29E	4	VULCAN ENERGY	NVN 074255	L	L	M	L	M	L	L	L	L	L	**H**	**H**	L	L
	5	VULCAN ENERGY	NVN 074255	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	8	VULCAN ENERGY	NVN 074255	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	9	VULCAN ENERGY	NVN 074255	L	L	M	L	M	L	L	L	L	L	**H**	**H**	L	L
	16	VULCAN ENERGY	NVN 074256	L	L	M	L	M	L	L	L	L	L	**H**	**H**	L	L
	17	VULCAN ENERGY	NVN 074256	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	20	VULCAN ENERGY	NVN 074256	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	21	VULCAN ENERGY	NVN 074256	L	L	M	L	M	L	L	L	L	L	**H**	**H**	L	L
16N 29E	19	VULCAN ENERGY	NVN 074257	L	L	L	M	M	L	L	L	L	L	**H**	**H**	L	L
	20	VULCAN ENERGY	NVN 074257	L	L	**H**	M	M	L	L	L	L	L	**H**	**H**	L	L
	21	VULCAN ENERGY	NVN 074257	L	L	**H**	M	M	L	L	L	L	L	**H**	**H**	L	L
	22	VULCAN ENERGY	NVN 074257	L	L	L	M	M	L	L	L	L	L	**H**	**H**	L	L
	23	VULCAN ENERGY	NVN 074258	L	L	L	M	M	L	L	L	L	L	**H**	**H**	L	L
	26	VULCAN ENERGY	NVN 074258	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	27	RON BARR	NVN 073930	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	28	RON BARR	NVN 073679	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	28	VULCAN ENERGY	NVN 074259	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	29	VULCAN ENERGY	NVN 074258	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	30	VULCAN ENERGY	NVN 074258	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	31	VULCAN ENERGY	NVN 074259	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	32	VULCAN ENERGY	NVN 074259	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	33	RON BARR	NVN 073679	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	33	VULCAN ENERGY	NVN 074259	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	34	RON BARR	NVN 073930	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L
	35	VULCAN ENERGY	NVN 074260	L	L	L	L	M	L	L	L	L	L	**H**	**H**	L	L

LEASE AREAS				ENVIRONMENTAL RESOURCE RISK BY RESOURCE													
Township / Range	Section	Lease Applicant	Serial Number	Air	Water	Land	Recreation	Visual	Biology	Wild Horse and Burro	Geology / Soils	Grazing	WSAs	Native American Concerns	Cultural Resources	Hazardous Materials	Socioeconomics
Aurora Crater Noncompetitive Lease Area																	
5N 28E	2	VULCAN ENERGY	NVN 074249	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	3	VULCAN ENERGY	NVN 074249	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	4	VULCAN ENERGY	NVN 074249	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	5	VULCAN ENERGY	NVN 074249	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	9	VULCAN ENERGY	NVN 074250	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	10	VULCAN ENERGY	NVN 074250	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	11	VULCAN ENERGY	NVN 074250	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	15	VULCAN ENERGY	NVN 074250	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	16	VULCAN ENERGY	NVN 074251	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
6N 28E	13	VULCAN ENERGY	NVN 074252	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	14	VULCAN ENERGY	NVN 074252	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	22	VULCAN ENERGY	NVN 074252	L	L	L	**H**	M	**H**	L	L	L	L	**H**	**H**	L	L
	23	VULCAN ENERGY	NVN 074252	L	L	L	**H**	M	**H**	L	L	L	L	**H**	**H**	L	L
	24	VULCAN ENERGY	NVN 074253	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	26	VULCAN ENERGY	NVN 074253	L	L	L	**H**	M	**H**	L	L	L	L	**H**	**H**	L	L
	27	VULCAN ENERGY	NVN 074253	L	L	L	**H**	M	**H**	L	L	L	L	**H**	**H**	L	L
	28	VULCAN ENERGY	NVN 074253	L	L	L	**H**	M	**H**	L	L	L	L	**H**	**H**	L	L
	32	VULCAN ENERGY	NVN 074254	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	33	VULCAN ENERGY	NVN 074254	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	34	VULCAN ENERGY	NVN 074254	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
	35	VULCAN ENERGY	NVN 074254	L	L	L	**H**	M	M	L	L	L	L	**H**	**H**	L	L
Wabuska Noncompetitive Lease Area																	
15N 25E	10	TOWNSEND DONALD GORDON	NVN 074953	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	11	DONALD G TOWNSEND	NVN 074899	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	12	DONALD G TOWNSEND	NVN 074899	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	13	DONALD G TOWNSEND	NVN 074899	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	14	DONALD G TOWNSEND	NVN 074899	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	15	DONALD G TOWNSEND	NVN 074901	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	16	DONALD G TOWNSEND	NVN 074901	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	17	DONALD G TOWNSEND	NVN 074900	L	L	L	M	M	M	L	L	L	L	**H**	M	L	L
	22	TOWNSEND DONALD GORDON	NVN 074953	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L
	23	TOWNSEND DONALD GORDON	NVN 074953	L	L	L	M	M	M	L	L	L	L	**H**	**H**	L	L

5. CONSULTATION AND COORDINATION

SECTION 5
CONSULTATION AND COORDINATION

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Lyon County
Mineral County
Churchill County

6. REFERENCES

SECTION 6
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7. LIST OF ACRONYMS

SECTION 7
LIST OF ACRONYMS

Acronym	Full Phrase
ACEC	Areas of critical environmental concern
AST	Aboveground storage tank
AUM	Animal unit month
BEA	Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
CAA	Clean Air Act
CCFO	Carson City Field Office
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMP	Conceptual management plan
CO	Carbon monoxide
CRMP	Consolidated resource management plan
CWA	Clean Water Act
DOE	Department of Energy
EA	Environmental assessment
EIS	Environmental impact statement
EO	Executive order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
F	Fahrenheit
FSC	Federal species of concern
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act of 1976

Acronym	Full Phrase
FONSI	Finding of no significant impact
FY	Fiscal year
GLO	Government land office
H_2S	Hydrogen sulfide
ha	Hectare
HMA	Herd management area
KGRA	Known geothermal resource area
m	Meter
MBTA	Migratory Bird Treaty Act
MMPA	Mining and Mineral Policy Act
MOU	Memorandum of understanding
mW	Megawatts
NA	Not applicable
NCES	National Center for Education Statistics
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Division of Wildlife
NDWP	Nevada Division of Water Planning
NEP	National Energy Policy
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNNPS	Northern Nevada Native Plant Society
NO_2	Nitrogen dioxide
NRCS	Natural Resources Conversation Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
O_3	Ozone
ODS	Ozone depleting substance
OHV	Off-highway vehicles
PCBs	Poly-chlorinated biphenyls
PL	Public law
PM_{10}	Inhalable particulate matter
$PM_{2.5}$	Fine particulate matter
RCRA	Resource Conservation and Recovery Act
RMP	Resource management plan
RMPA	Resource management plan (amended)
ROI	Region of influence
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Officer
SO_2	Sulfur dioxide
SO_4	Sulfate particles

Acronym	Full Phrase
SPCC	Spill prevention, control, and countermeasures
SR	State route
T&E	Threatened and endangered
TCID	Tahoe-Carson Irrigation District
TCP	Traditional cultural property
TSCA	Toxic Substances Control Act
US	United States
USC	United States Code
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
VRM	Visual resource management
WMA	Wildlife management area
WSA	Wilderness study area

APPENDIX A

NONCOMPETITIVE LEASE APPLICATIONS SUBMITTED TO THE CARSON CITY FIELD OFFICE (AS OF MAY 1, 2002)

Appendix A
All Noncompetitive Lease Applications Submitted to the Carson City Field Office (as of May 1, 2002)

Lease Applicant	Serial Number	Township / Range	Section	Subsection	Lots	Lease Status
Aurora Crater Noncompetitive Lease Area						
VULCAN ENERGY	NVN 074249	5N 28E	2	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074249	5N 28E	3	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074249	5N 28E	4	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074249	5N 28E	5	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074250	5N 28E	9	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074250	5N 28E	10	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074250	5N 28E	11	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074250	5N 28E	15	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074251	5N 28E	16	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074252	6N 28E	13	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074252	6N 28E	14	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074252	6N 28E	22	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074252	6N 28E	23	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074253	6N 28E	24	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074253	6N 28E	26	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074253	6N 28E	27	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074253	6N 28E	28	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074254	6N 28E	32	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074254	6N 28E	33	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074254	6N 28E	34	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074254	6N 28E	35	ENTIRE SECTION		Open
Wabuska Noncompetitive Lease Area						
TOWNSEND DONALD GORDON	NVN 074953	15N 25E	10	S2		Open
DONALD G TOWNSEND	NVN 074899	15N 25E	11	ENTIRE SECTION		Open
DONALD G TOWNSEND	NVN 074899	15N 25E	12	ENTIRE SECTION		Open
DONALD G TOWNSEND	NVN 074899	15N 25E	13	ENTIRE SECTION		Open
DONALD G TOWNSEND	NVN 074899	15N 25E	14	NW,SE		Open
DONALD G TOWNSEND	NVN 074901	15N 25E	15	N2		Open
DONALD G TOWNSEND	NVN 074901	15N 25E	16	N2		Open
DONALD G TOWNSEND	NVN 074900	15N 25E	17	N2,N2SW		Open
TOWNSEND DONALD GORDON	NVN 074953	15N 25E	22	N2NE,SWNE,NWSE		Open
TOWNSEND DONALD GORDON	NVN 074953	15N 25E	23	N2, N2SW		Open
Lee Hot Springs Noncompetitive Lease Area						
VULCAN ENERGY	NVN 074255	15N 29E	4	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074255	15N 29E	5	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074255	15N 29E	8	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074255	15N 29E	9	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074256	15N 29E	16	ENTIRE SECTION		Open

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Lease Applicant	Serial Number	Township / Range	Section	Subsection	Lots	Lease Status
VULCAN ENERGY	NVN 074256	15N 29E	17	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074256	15N 29E	20	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074256	15N 29E	21	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074257	16N 29E	19	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074257	16N 29E	20	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074257	16N 29E	21	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074257	16N 29E	22	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074258	16N 29E	23	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074258	16N 29E	26	ENTIRE SECTION		Open
RON BARR	NVN 073930	16N 29E	27	ENTIRE SECTION		Open
RON BARR	NVN 073679	16N 29E	28	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074259	16N 29E	28	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074258	16N 29E	29	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074258	16N 29E	30	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074259	16N 29E	31	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074259	16N 29E	32	ENTIRE SECTION		Open
RON BARR	NVN 073679	16N 29E	33	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074259	16N 29E	33	ENTIRE SECTION		Open
RON BARR	NVN 073930	16N 29E	34	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 074260	16N 29E	35	ENTIRE SECTION		Open
Salt Wells Noncompetitive Lease Area						
VULCAN ENERGY	NVN 066737	16N 30E	1	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074723	16N 30E	1	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066737	16N 30E	2	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074723	16N 30E	2	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066737	16N 30E	3	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074723	16N 30E	3	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074717	16N 30E	4	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074717	16N 30E	9	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074718	16N 30E	10	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074718	16N 30E	11	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074718	16N 30E	12	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074714	16N 31E	6	SE,S2NE,SENW,E2SW;		Open
NGP POWER CORP	NVN 074714	16N 31E	7	E2,E2W2;	1-4	Open
NGP POWER CORP	NVN 074719	17N 29E	1	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074719	17N 29E	12	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074719	17N 29E	13	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074719	17N 29E	24	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada

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Lease Applicant	Serial Number	Township / Range	Section	Subsection	Lots	Lease Status
NGP POWER CORP	NVN 074720	17N 29E	25	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074720	17N 29E	36	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074706	17N 30E	1	S2,NW;		Open
NGP POWER CORP	NVN 074706	17N 30E	2	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074706	17N 30E	3	E2,S2NW;	3,4	Open
NGP POWER CORP	NVN 074706	17N 30E	4	S2,S2N2;	1-4	Open
NGP POWER CORP	NVN 074707	17N 30E	5	S2,S2N2;	1-4	Open
NGP POWER CORP	NVN 074707	17N 30E	6	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074707	17N 30E	7	N2,SENE;	7-12	Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074707	17N 30E	8	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074708	17N 30E	9	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074708	17N 30E	10	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074708	17N 30E	11	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074708	17N 30E	12	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074709	17N 30E	13	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074709	17N 30E	14	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066738	17N 30E	15	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074721	17N 30E	15	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074709	17N 30E	16	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074709	17N 30E	17	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074710	17N 30E	18	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074710	17N 30E	19	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074710	17N 30E	20	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074710	17N 30E	21	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066738	17N 30E	22	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074721	17N 30E	22	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066738	17N 30E	27	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074721	17N 30E	27	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074711	17N 30E	28	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074711	17N 30E	29	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074711	17N 30E	30	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074711	17N 30E	31	ENTIRE SECTION		Not leasable - Future Conveyance to State of Nevada
NGP POWER CORP	NVN 074712	17N 30E	32	ENTIRE SECTION		Open

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Lease Applicant	Serial Number	Township / Range	Section	Subsection	Lots	Lease Status
NGP POWER CORP	NVN 074712	17N 30E	33	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066738	17N 30E	34	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074722	17N 30E	34	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066739	17N 30E	35	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074722	17N 30E	35	ENTIRE SECTION		Open
VULCAN ENERGY	NVN 066739	17N 30E	36	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074722	17N 30E	36	ENTIRE SECTION		Open
HENKLE AND ASSOCIATES	NVN 075609	17N 31E	20	ENTIRE SECTION		Open
HENKLE AND ASSOCIATES	NVN 075815	17N 31E	29	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074713	17N 31E	30	E2,E2W2;	1-4	Open
NGP POWER CORP	NVN 074713	17N 31E	31	E2,E2W2;	1-4	Open
HENKLE AND ASSOCIATES	NVN 075815	17N 31E	32	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074715	18N 30E	19	E2,E2W2;	1	Open
NGP POWER CORP	NVN 074715	18N 30E	20	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074716	18N 30E	28	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074715	18N 30E	29	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074715	18N 30E	30	E2,E2W2;	3,4	Open
NGP POWER CORP	NVN 074716	18N 30E	31	E2,NENW,E2SW;		Open
NGP POWER CORP	NVN 074716	18N 30E	32	ENTIRE SECTION		Open
NGP POWER CORP	NVN 074716	18N 30E	33	ENTIRE SECTION		Open
Steamboat Noncompetitive Lease Area						
EVERGREEN ENERGY	NVN 075484	16N 19E	3	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075484	16N 19E	4	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075484	16N 19E	28	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075484	16N 19E	33	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 074884	17N 19E	12	NE,E2NW,N2SW,S2SW		Open
EVERGREEN ENERGY	NVN 075252	17N 19E	13	W2NE		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075252	17N 19E	15	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075252	17N 19E	23	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075252	17N 19E	27	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe

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Lease Applicant	Serial Number	Township / Range	Section	Subsection	Lots	Lease Status
						Plan Amendment
EVERGREEN ENERGY	NVN 066218	17N 19E	21	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 074884	17N 20E	8	E2,SENW,NESW,S2SW		Open
EVERGREEN ENERGY	NVN 074884	17N 20E	17	NESW		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 074884	17N 20E	18	W2SE,E2E2	1 of SW, 3-11	Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 074884	17N 20E	20	N2,N2S2,SWSW,SESE	1,2	Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075485	18N 19E	33	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
EVERGREEN ENERGY	NVN 075485	18N 20E	34	ENTIRE SECTION		Not leasable - Leasing Prohibited by Washoe Plan Amendment
Hazen Noncompetitive Lease Area						
KINGZETT JAMES M	NVN 075005	20N 25E	24	ENTIRE SECTION		Not leasable - Within the KGRA
KINGZETT JAMES M	NVN 075005	20N 26E	18	ENTIRE SECTION		Open
KINGZETT JAMES M	NVN 075005	20N 26E	20	ENTIRE SECTION		Not leasable - Within the KGRA
KINGZETT JAMES M	NVN 075005	20N 26E	30	ENTIRE SECTION		Open
Stillwater Noncompetitive Lease Area						
STILLWATER HOLDINGS LLC	NVN 075589	19N 30E	25	ENTIRE SECTION		Not leasable - Within the KGRA
STILLWATER HOLDINGS LLC	NVN 075589	19N 31E	17	E2,NENW,SW		Not leasable - USFWS and private land
STILLWATER HOLDINGS LLC	NVN 075589	19N 31E	20	ENTIRE SECTION		Not leasable - USFWS land
STILLWATER HOLDINGS LLC	NVN 075594	20N 30E	13	ENTIRE SECTION		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075592	20N 30E	14	ENTIRE SECTION		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075592	20N 30E	22	ENTIRE SECTION		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075592	20N 30E	23	ENTIRE SECTION		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075594	20N 30E	24	ENTIRE SECTION		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075591	20N 30E	26	NW,SE		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075604	20N 30E	26	NE		Not leasable - Private land
STILLWATER HOLDINGS	NVN 075592	20N 30E	27	ENTIRE SECTION		Not leasable - State of

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All Noncompetitive Lease Applications Submitted to the Carson City Field Office (as of May 1, 2002)

Lease Applicant	Serial Number	Township / Range	Section	Subsection	Lots	Lease Status
LLC						Nevada land
STILLWATER HOLDINGS LLC	NVN 075591	20N 30E	34	NW		Not leasable - State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075591	20N 30E	35	NW,E2SE		Not leasable - Within the KGRA
STILLWATER HOLDINGS LLC	NVN 075594	20N 31E	7	W2NE,E2NW,NESW,NWSE	1,2,3,4	Not leasable - Private and State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075593	20N 31E	11	E2,SENW,E2SW,SWSW		Not leasable - State of Nevada and Private land
STILLWATER HOLDINGS LLC	NVN 075593	20N 31E	14	ENTIRE SECTION		Not leasable - USFWS and State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075604	20N 31E	19	Lots	1,2,3,4	Not leasable - Private land
STILLWATER HOLDINGS LLC	NVN 075593	20N 31E	22	E2		Not leasable - USFWS land
STILLWATER HOLDINGS LLC	NVN 075590	20N 31E	27	E2,NENW,S2NW,SW		Not leasable - USFWS and private land
STILLWATER HOLDINGS LLC	NVN 075590	20N 31E	28	E2SE		Not leasable - USFWS land
STILLWATER HOLDINGS LLC	NVN 075594	20N 31E	18	Lots	1,2,3,4	Not leasable - Private and State of Nevada land
STILLWATER HOLDINGS LLC	NVN 075590	20N 31E	33	E2,SENW,E2SW		Not leasable - USFWS and private land
Soda Lake Noncompetitive Lease Area						
HENKLE AND ASSOCIATES	NVN 075817	19N 27E	2	SWSW,S2NW,SE	1,2,3,4	Open
HENKLE AND ASSOCIATES	NVN 075816	19N 28E	6	SENE		Open
HENKLE AND ASSOCIATES	NVN 075816	19N 28E	8	NWNE,NENE,N2SENE		Open
HENKLE AND ASSOCIATES	NVN 075816	19N 28E	10	NENE,N2SE,SESE		Open
Miscellaneous						
EMPIRE ENERGY	NVN 075558	29N 22E	27	ENTIRE SECTION		Not leasable - Within Pyramid Lake Indian Reservation.
EMPIRE ENERGY	NVN 075558	29N 22E	34	ENTIRE SECTION		Not leasable - Within Pyramid Lake Indian Reservation.

APPENDIX B

AGENCY CORRESPONDENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE

NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502-7147

September 13, 2001
File No.1-5-01-SP-275

Memorandum

To: Thomas V. Leshendok, Deputy State Director, Minerals Management, State Office, Bureau of Land Management, Reno, Nevada

From: Field Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Species List for the Proposed Geothermal Lease Locations

In response to your letter dated August 27, 2001, we have identified the listed species, that may be present in the vicinity of or affected by the proposed project (Attachment A). The Steamboat buckwheat, (*Eriogonum ovalifolium* var. *williamsiae*) a plant specifically listed as endandered, is known to occur in the Steamboat Springs area south of Reno, NV. The bald eagle, (Haliaeetus leucocephalus) a federally listed threatened species is known from three potential project locations. To the best of our knowledge, there are no proposed or candidate species in these areas. This fulfills the requirement of the Fish and Wildlife Service to provide information on listed species pursuant to section 7(c) of the Endangered Species Act of 1973 (Act), as amended. Attachment B provides a discussion of the responsibilities Federal agencies have under section 7 of the Act and the conditions under which a biological assessment (BA) must be prepared by the lead Federal agency or its designated non-Federal representative. Lists of published references dealing with the distribution, life history, and habitat requirements of the listed species are also included (Attachment C).

The Service is concerned about potential impacts that the expansion of the geothermal operation at Steamboat Springs, Nevada may have on the Steamboat buckwheat which is the only federally-listed (endangered) plant species in northern Nevada. Further development of existing geothermal resources or facilities in this area would likely result in increased fragmentation and direct losses of habitat and individual plants. The majority of the species' occupied habitat (approximately 77 percent) is located on privately owned lands, while much of the remainder (approximately 23 percent) occurs on public lands classified as an Area of Critical Environmental Concern managed by the Bureau of Land Management. These lands support features such as fumaroles that may be important in the ecological and biological persistence of this species and its habitat.

Steamboat buckwheat is also listed by the State of Nevada as "critically endangered" under Nevada Revised Statutes (NRS) 524.260, *et seq.* The Nevada Division of Forestry administers NRS 527.270, requiring that no species designated as critically endangered be removed or

destroyed except under special permit issued by the State Forester Firewarden. Nevada State law regarding State-listed endangered plants, including Steamboat buckwheat, is the primary legal mechanism protecting listed species and their habitats on private lands.

We also recommend that you evaluate the potential indirect effects to listed species and their habitats that may result from alteration of surface flows, springs and other geothermal features. Cumulative effects such as regional ground water drawdown should also be considered prior to development of any potential energy project.

If the lead Federal agency determines that a listed species may be affected by the proposed project, then that agency or the designated non-Federal lead should initiate consultation pursuant to 50 CFR § 402.14. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to listed species. If a BA is required, and it is not initiated within 90 days of your receipt of this letter, you should informally verify the accuracy of this list with our office. If, through informal consultation or development of a BA, or both, the Federal agency determines that the proposed action is not likely to adversely affect the listed species, and the Service concurs in writing, then the consultation process is terminated and formal consultation is not required.

Included in Attachment A is a list of other species of concern to the Service which may occur in the vicinity of the project area. The Service has used information from State and Federal agencies and private sources to assess the conservation needs of these species. Determination of the conservation status of these taxa will require further biological research and field study. By considering these species and by exploring management alternatives early in the planning process it may be possible to provide long-term conservation benefits for these species and avoid future conflicts that otherwise could develop. We recommend that you contact the Nevada Natural Heritage Program [1550 East College Parkway, Suite 145, Carson City, Nevada 89710, (775) 687-4245] and the appropriate regional office of the Nevada Division of Wildlife, as well as other local, State, and Federal agencies for distribution data and information on the conservation needs of these and other species of concern.

Please reference File No. 1-5-01-SP-275 in future correspondence concerning this species list. If you have any questions, please contact Chad Mellison at (775) 861-6300.

Sincerely,

for Robert D. Williams
Field Supervisor

Attachments

Attachment A

LISTED SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED GEOTHERMAL LEASE APPLICATIONS

File Number: 1-5-01-SP-275

Listed Threatened (T) or Endangered (E) Species

Bird		
T	Bald eagle	*Haliaeetus leucocephalus* (1,5,11)
Plants		
E	Steamboat buckwheat	*Eriogonum ovalifolium* var. *williamsiae* (8)

Species of Concern

Mammals	
Pygmy rabbit	*Brachylagus idahoensis* (14)
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens* (14)
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii* (14)
Spotted bat	*Euderma maculatum* (14)
Small-footed myotis	*Myotis ciliolabrum* (14)
Long-eared myotis	*Myotis evotis* (14)
Fringed myotis	*Myotis thysanodes* (14)
Long-legged myotis	*Myotis volans* (14)
Yuma myotis	*Myotis yumanensis* (8,9,13)
Birds	
Northern goshawk	*Accipiter gentilis* (1,2,3,5,7,10,11,13)
Western burrowing owl	*Athene cunicularia hypugea* (14)

Fish

Dixie Valley tui chub	*Gila bicolor* ssp. (6)
Fish Lake Valley tui chub	*Gila bicolor* ssp. (13)

Plants

Eastwood's milkweed	*Asclepias eastwoodiana* (7)
Toquima milkvetch	*Astragalus toquimanus* (7)

Key to Geothermal Sites

1. Beowave
2. Gerlach
3. San Emidio
4. North Canyon
5. Rye Patch
6. Dixie Valley
7. Round Mountain
8. Steamboat
9. Hazen
10. Soda Lake
11. Stillwater
12. Salt Wells
13. Fish Lake
14. All Sites

LIST ARTHUR NR PEC WALT

United States Department of the Interior

FISH AND WILDLIFE SERVICE

NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502-7147

2002 JUN -4 PM 12:31

BUREAU OF LAND MGMT
CARSON CITY
FIELD OFFICE

June 03, 2002
File No.1-5-02-SP-217

Memorandum

To: Manager, Carson City Field Office, Bureau of Land Management, Carson City, Nevada

From: Field Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Species List for the Proposed Geothermal Lease Locations Near Lee Hot Springs, Aurora Crater, and Wabuska

In response to your letter received on May 22, 2002, we have enclosed a list of threatened species which may occur in the subject project area (Attachment A). This list fulfills the requirement of the Fish and Wildlife Service (Service) to provide information on listed species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended (Act), for projects that are authorized, funded, or carried out by a Federal agency.

Your proposed project is located within a potential metapopulation for Lahontan Cutthroat Trout (LCT), and as such, the area may be necessary for the species' recovery. The Walker River Recovery Implementation Team (WRRIT) has been formed to facilitate the restoration and recovery of LCT populations in this area. The WRRIT will be evaluating areas within this basin which could support LCT. Although a self-sustaining population of LCT may not currently be present in the project area, under the Act, completed projects should not preclude future recovery and survival of this species. We recommend that projects be reviewed for all direct and indirect impacts that they may have on riparian and aquatic habitats as they relate to LCT, and that you consult with the Service accordingly under section 7 of the Act.

We recommend that you evaluate the potential indirect effects to listed species and their habitats that may result from alteration of surface flows, springs, and other geothermal features. Cumulative effects such as regional ground water drawdown should also be considered prior to development of any potential energy project.

For your consideration, Attachment A also contains a list of other species of concern to the Service which may occur in the project area. The Service has used information from State and Federal agencies and private sources to assess the conservation needs and status of these species. Further biological research and field study are needed to resolve their conservation status. By considering these species and exploring management alternatives early in the planning process, it may be possible to provide long-term conservation benefits for these species and avoid future conflicts that could otherwise develop. We recommend that you contact the Nevada Natural Heritage Program [1550 East College Parkway, Suite 145, Carson City, Nevada 89710, (775) 687-4245] and the appropriate regional office of the Nevada Division of Wildlife, as well as other local, State, and Federal agencies for distribution data and information on the conservation needs of these and other species of concern.

We also recommend that any land clearing or other surface disturbance associated with proposed actions within the project area be timed to avoid potential destruction of active bird nests or young of birds that breed in the area. Such destruction may be in violation of the Migratory Bird Treaty Act (MBTA) (15 U.S.C. 701-718h). Under the MBTA, active nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend a qualified biologist survey the area prior to land clearing. If active nests are located, or if other evidence of nesting (*i.e.*, mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the habitat requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

Please reference File No. 1-5-02-SP-217 in future correspondence concerning this species list. If you have any questions or require additional information, please contact me or Chad Mellison at (775) 861-6300.

Sincerely,

for Robert D. Williams
Field Supervisor

Attachment

ATTACHMENT A

THREATENED SPECIES
AND SPECIES OF CONCERN
that may occur in
GEOTHERMAL RESOURCE AREAS NEAR LEE HOT SPRINGS, AURORA CRATER, AND WABUSKA
Churchill, Mineral, and Lyon Counties, Nevada

File No. 1-5-02-SP-217; June 03, 2002

Threatened Species

Fish

Lahontan cutthroat trout	*Oncorhynchus clarki henshawi* (2)

Species of Concern

Mammals

Pygmy rabbit	*Brachylagus idahoensis* (4)
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens* (4)
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii* (4)
Spotted bat	*Euderma maculatum* (4)
Fletcher dark kangaroo mouse	*Microdipodops megacephalus nasutus* (2)
Small-footed myotis	*Myotis ciliolabrum* (4)
Long-eared myotis	*Myotis evotis* (4)
Fringed myotis	*Myotis thysanodes* (4)
Long-legged myotis	*Myotis volans* (4)
Yuma myotis	*Myotis yumanensis* (4)

Birds

Northern goshawk	*Accipiter gentilis* (2)
Western burrowing owl	*Athene cunicularia hypugea* (4)
Sage grouse	*Centrocercus urophasianus* (2)

Invertebrates

Wongs springsnail	*Pyrgulopsis wongi* (2)
Hardys aegialian scarab beetle	*Aegialia hardyi* (1)
Sand Mountain aphodius scarab	*Aphodius* sp. (1)
Sand Mountain blue butterfly	*Euphilotes pallescens arenamontana* (1)
Sand Mountain serican scarab	*Serica* sp. (1)

Plants

Bodie Hills rockcress	*Arabis bodiensis* (2)
Bodie Hills draba	*Cusickiella quadricostata* (2)

Mono phacelia	*Phacelia monoensis* (2)
Williams Combleaf	*Polyctenium williamsiae* (2)
Masonic Mountain jewelflower	*Streptanthus oliganthus* (2)

Key to Geothermal Sites

1. Lee Hot Springs
2. Aurora Crater
3. Wabuska
4. All Sites

APPENDIX C

REASONABLE DEVELOPMENT SCENARIO

APPENDIX C
REASONABLE DEVELOPMENT SCENARIO

Although the proposed action involves the issuance of leases for geothermal resources by the Carson City Field Office of the BLM, it is reasonable to assume that the investment in obtaining a lease could eventually result in the use of geothermal resources. In order to assess the potential for environmental impacts that may result in an area as a result of lease approval, a reasonable development scenario has been developed. The reasonable development scenario for geothermal resource use involves four sequential phases: (1) exploration, (2) development, (3) production, and (4) closeout. The success or failure of each phase affects the implementation of subsequent phases, and, therefore, subsequent environmental impacts.

The general assumptions outlined in the following four phases serve to establish reasonable development possibilities for analyzing future environmental impacts that may result from the Carson City Field Office issuing leases for geothermal resources. It should be noted that the reasonable development scenario permits a general evaluation of the types of impacts that may occur but cannot accurately predict the magnitude and extent of these impacts. This is due in part to the inability to predict future development scenarios, including types of development, timing, and location. It is also due in part to the fact that the development scenario is based on expected activities undertaken for single lease. Since a lease can range in size from a portion of one section of land (less than 640 acres) up to four sections of land (2,560 acres), potential impacts may be concentrated or diffuse depending on the size a lease development and the number of developments in an area.

Phase One: Geothermal Resource Exploration

A known geothermal resource area (KGRA) is an area where BLM determines that persons knowledgeable in geothermal development would spend money to develop geothermal resources (43 CFR Part 3200). Before geothermal resources are developed, however, a geothermal resource developer explores geothermal resources on leased land to determine the location of suitable geothermal reservoirs within the KRGA. For the same reason, exploration is equally important within a non-KGRA. Exploration

involves first surveying and then drilling temperature gradient wells. It would take between one and five years to complete exploration.

Surveys

Surveying includes conducting or analyzing satellite imagery and aerial photography, volcanological studies, geologic and structural mapping, geochemical surveys, and geophysical surveys of leaseable areas that could support geothermal resource development. The surveys consist of collecting electrical, magnetic, chemical, seismic, and rock data. For example, water samples from hot springs could be used to determine the subsurface characteristics of a particular area. Once the data is compiled, geologists and drillers examine the data and make inferences about where the higher temperature gradients may occur. High temperature gradients can indicate the location of potential underground geothermal reservoirs capable of supporting commercial uses.

The environmental impacts from the physical surveys are similar to impacts that result from recreation activities, such as hiking, driving, or camping, that typically occur on federal lands. Therefore, a geothermal resource developer would not be required to obtain authorization from BLM prior to conducting these surveys.

Temperature Gradient Wells

The second step of the exploration phase is to drill temperature gradient wells on leased land. This allows the lessee to confirm a more precise location of high temperature gradients. Temperature gradient wells can be drilled using a truck-mounted rig and range from 200 feet to over 4,000 feet deep. Geologists examine either rock fragments or long cores of rock that are brought up from deep within the well. Also, temperatures are measured at depth. Both well temperatures and the results of rock sample analyses are used to determine if additional exploration is necessary to identify the presence and characteristics of an underground geothermal reservoir.

With the exception of impacts to air quality, the environmental impacts from exploration could be localized to access road construction and the construction and operation of the temperature gradient well. Whenever possible, a driller would access the temperature gradient well site using existing roads. When existing roads are not available, new access roads may need to be constructed for the truck-mounted rig to reach the site.

Preparing the site for drilling could include leveling the surface and clearing away vegetation. The lessee could drill several temperature gradient wells on a lease to determine both the areal extent of the temperature anomaly and where the highest temperature gradient occurs. Each drill site could disturb approximately 0.07 acre, and the drill rig could be approximately 60 feet tall. During exploration, a driller may not produce any fluids out of, or inject any fluids into, the well. In addition to the drill rig, a diesel generator may also be used at the site to power equipment.

All surface disturbances would be reclaimed to the satisfaction of BLM. If a temperature gradient well was unsuccessful, it would be abandoned, and the drill site

would be reclaimed. Abandonment includes plugging, capping, and covering the wells. Reclamation includes removing all surface equipment and structures, regrading the site to predisturbance contours, and replanting native vegetation.

Phase Two: Geothermal Resource Development

Based on the results of exploration, geothermal resource development would involve assembling the infrastructure needed to use the underground geothermal reservoir. The type of development that occurs would be based on the size and temperature of the geothermal reservoir. Geothermal resources can be classified as low temperature (less than 90°C, or 194°F), moderate temperature (90°C to 150°C, or 194 to 302°F), and high temperature (greater than 150°C, or 302°F). The highest temperature resources are generally used only for generating electric power, and uses for both low and moderate temperature resources can be either direct use or ground-source heat pumps. Direct use involves using the heat in the water directly for such things as heating buildings, industrial processes, greenhouses, aquaculture (growing fish), and resorts. Direct use projects generally use resource temperatures between 38°C (100°F) and 149°C (300°F). A ground-source heat pump, which moves heat from one place to another, transfers heat from the soil to a house during the winter and heat from a house to the soil in summer. It uses geothermal resource temperatures between 4°C (40°F) and 38°C (100°F).

High temperature reservoirs are suitable for the commercial production of electricity. Three types of power plants that harness geothermal resources are dry steam plants, flash steam plants, and binary-cycle plants. Dry steam power plants use the steam from the geothermal reservoir as it comes from the wells and route it directly through turbine/generator units to produce electricity. Flash steam power plants use water at temperatures greater than 182°C (360°F). Water is pumped under high pressure to the generation equipment at the surface, the pressure is suddenly reduced, allowing some of the hot water to convert' or "flash," into steam, and the steam is used to power the turbine/generator units to produce electricity. Binary-cycle power plants use water from the geothermal reservoir to heat another "working fluid." The working fluid is vaporized and used to turn the turbine/generator units. The geothermal water and the working fluid never come in contact with each other. Binary-cycle power plants can operate with lower water temperature 107°C to 182° C (225°F to 360°F) and produce few air emissions.

The development phase involves the most intense activity and would occur over two to ten years. Drilling would take place 24 hours a day. If a reservoir is discovered, characteristics of the well and the reservoir are determined by flow testing the well. If the well and reservoir were sufficient for development, a wellhead, with valves and control equipment, would be built on top of the well casing. Development activity would involve the following construction and operation:

- Access roads—New access roads to accommodate the larger equipment associated with the development phase could be constructed. The roads could be approximately 0.5 mile to 3 miles long. New access roads could

also be necessary for accessing the user of the geothermal resource (see fourth bullet below).

- Drill site development—Production-size wells can be over two miles (10,560 feet) deep. In order to drill these deep holes, a two-acre well pad would be constructed and a large drill would be erected. Up to two wells may be drilled per lease.
- Geothermal pipelines—The pipelines are usually 24 to 36 inches in diameter and are covered with insulation. When feasible, they would parallel the access roads and existing roads to the destination of the geothermal resource's steam or water. The pipelines would be no longer than approximately four miles.
- Geothermal resource user—Most of the geothermal resources are expected to be used for power plants or put to direct use. A power plant could occupy 10 acres. The desired use of the geothermal resource's steam or water would be based on the location of the underground reservoir and its temperature.
- Electric transmission lines—Transmission lines may range in length from 5 miles to 50 miles. Wooden poles would most likely support them, and one acre could be disturbed per mile of transmission line.
- Reclamation—If a production well were successful, a wellhead with valves and control equipment would be built on top of the well casing. The well site would be reclaimed to the satisfaction of BLM. Reclamation includes removing all surface equipment and structures, regrading the site to predisturbance contours, and replanting native vegetation. If a production well were unsuccessful, the well would be abandoned. Abandonment includes plugging, capping, and covering the wells.

The greatest environmental impacts are more likely to occur during the development phase because of the intense production well drilling activity. Also, infrastructure, such as a power plant or greenhouse, for utilizing the geothermal resource would need to be constructed. The following environmental impacts could be associated with the above construction and operation activity of the development phase:

- Air quality—Impacts to air quality could include emissions from diesel generators and engines during construction, venting of hydrogen sulfide from the well, slight heating of the local atmosphere around the well, localized fogging around the well, or fugitive dust emissions during construction.
- Water quality—Impacts to water quality could include polluted surface water runoff during construction, obtaining rights to use water for drilling in very arid areas, lowering the groundwater table at the well site, or saline intrusion at the well site.

- Biological resources—Impacts to flora and fauna for all aspects of the development phase could include the loss of vegetation and habitat, the alteration of migratory routes, loss of nesting and denning sites, animals (especially birds and bats) wandering on-site and coming into contact with poisonous substances, and the invasion of noxious weeds in disturbed areas.
- Noise—Impacts associated with noise for all aspects of the development phase could include disturbances to nearby humans and animals from equipment noise or groundborne vibration and noise.
- Cultural resources—Impacts to cultural resources for all aspects of the development phase could include damaging undiscovered or buried resources or activities that disturb prayer or meditation sites.
- Geology—Impacts to geology and soil could include subsidence from drilling and withdrawal/injection activity. Soil erosion and landslides could also occur during all aspects of the development phase.
- Hazards—Impacts from hazards at the drill site could include the disposal of drilled material and drilling mud and induced seismicity from injection. Impacts to hazards during all aspects of the development phase could include accidental spills, fires, routine use of hazardous materials (such as solvents and fuels) to operate and maintain equipment and facilities or disposal of piping or old equipment.
- Aesthetics—Impacts to aesthetics during all aspects of the development phase could include nighttime glare from safety/security lighting or the visibility of industrial structures and activity in undeveloped remote locations.

Phase Three: Production

The production phase could last from 10 to 30 years and involves the operation and maintenance of the geothermal field(s) and includes new drill sites. The drilling of new production wells, if necessary, in order to manage a geothermal field would involve drilling and impacts that are similar to those discussed above in the development phase.

Operation and maintenance of existing facilities and production of geothermal energy would also take place during the production phase. Environmental impacts associated with operation and maintenance and energy production would involve managing waste generated by daily activities; equipment, fugitive dust, and well emissions; noise from equipment, vehicles, and wells; and managing geothermal water.

Phase Four: Closeout

This phase involves abandoning the well after production ceases and reclaiming all disturbed areas in conformance with BLM standards. Abandonment includes plugging, capping, and covering the wells. Reclamation includes removing all surface equipment and structures, regrading the site to predisturbance contours, and replanting native vegetation.

APPENDIX D

STANDARD OPERATING PROCEDURES AND CONDITIONS OF APPROVAL

APPENDIX D
STANDARD OPERATING PROCEDURES AND CONDITIONS OF APPROVAL

D.1 STANDARD OPERATING PROCEDURES (SOPS)

In addition to the restrictions on leasing authority contained in the Geothermal Steam Act, the CCFO CRMP, and other established law or regulation, as described in Chapter 1, the following SOPs for leasable minerals are set forth in the CCFO CRMP (BLM 2000). These SOPs define the approach to managing leasable mineral exploration and development in the CCFO management area.

1. Oil, gas, and geothermal exploration and production upon BLM land are conducted through leases with the Bureau and are subject to terms and stipulations to comply with all applicable federal and state laws pertaining to various considerations for sanitation, water quality, wildlife, safety, and reclamation. Stipulations may be site specific and are derived from the environmental analysis process.

2. Geophysical exploration permits for oil, gas or geothermal resources may be obtained prior to leasing of the lands. Mitigation of any resource conflicts identified in the review process will be stipulated in the permit.

3. Wilderness Study Areas are closed to mineral leasing.

D.2 CONDITIONS OF APPROVAL (COAS)

All ground disturbing activity related to geothermal exploration, development, operation, and closeout in the CCFO management area are subject to BLM environmental review and permit approval. As part of these reviews, BLM may require the following types of measures to reduce impacts to resources. Measures listed below are representative of the types of measures that may be included as part of environmental review or permit approval. Additional measures may be included to address site-specific concerns, including SOPs for other resources described in the CCFO CRMP.

D.2.1 CONDITIONS OF APPROVAL (COAs)

Geophysical Exploration

1. The operator shall furnish a project map(s) at a minimum scale of 1:100,000 with the Notice of Intent (NOI) depicting the approximate line route to be used. A map shall also be filed with the Notice of Completion (NOC) depicting the actual location of the complete line.

2. Any changes in location of exploration lines or test arrays will be brought to the attention of the Authorized Officer (AO) prior to the change being made on the ground.

3. No blading or other dirt work will be allowed without prior approval of the AO.

4. Activities of the geophysical operations shall not prevent, obstruct, or unduly interfere with any activities of other authorized users of the public lands.

5. Removal or alteration of existing improvements (fences, cattle guards, etc.) is not permitted without prior approval of the AO. Existing improvements will be maintained in a serviceable and safe condition.

6. Fences shall not be cut without prior approval of the AO. Before cutting through any fences, the operator shall firmly brace the fence on both sides of the cut; a temporary gate will be installed for use during the course of operations unless the fence is immediately repaired. Upon completion of operations, fences shall be restored to at least their original condition.

7. During periods of adverse conditions affecting soil moisture caused by climatic factors such as thawing, heavy rains, snow, flooding, or drought, all activities off existing maintained roads that create excessive surface rutting may be suspended. When adverse conditions exist, the operator will contact the AO for an evaluation and decision based on soil types, soil moisture, slope, vegetation, and cover.

8. Off-road vehicle travel will be limited to that which is necessary for the completion of the geophysical operations. Multiple off-road travel routes will not be permitted without AO approval.

9. The use of specialized low surface impact equipment (wide or balloon tired vehicles, ATVs) and/or helicopters may be required for any activities in off-road areas where it is deemed necessary by the AO to protect the fragile soils and/or other resource values.

10. Powder magazines shall be located at least ¼-mile from traveled roads. Loaded shot holes and charges shall be attended at all times.

11. No blasting will be permitted within ¼-mile of historic trails, natural areas, identified archaeological sites, recreation areas, known caves, water wells, or springs.

12. All trash, flagging, lath, etc. will be removed and hauled to an authorized disposal site. No oil or lubricants shall be drained into the ground surface.

13. Areas proposed for project routes or surface disturbance will be inventoried for the presence of noxious weeds prior to commencement of activities.

14. A noxious weed control program will be developed, maintained, and implemented by the lessee in order to prevent and avoid the proliferation of noxious weeds, as defined in the Nevada Designated Noxious Weed List. The control program shall include a monitoring strategy and contingency plans to address noxious weed control for a period of at least 5 years following completion of use or closeout. The underside of all heavy equipment must be cleaned by water before entering public lands to do work. Driving through or parking on noxious weed infestations will be avoided.

15. It is the responsibility of the lessee/operator to control and treat for noxious weeds and all infestations of noxious or poisonous weeds, resulting from surface disturbance caused by the operator, will be controlled before spreading occurs into the surrounding area.

16. All disturbed areas will be reclaimed as directed by the AO. Bond liability will not be released until this reclamation is completed to the satisfaction of the AO.

17. Reclamation required by the AO will be done concurrently with the exploration operations insofar as possible or within 30 days of the AO's receipt of the NOC.

18. Disturbed areas will be re-seeded with a diverse native perennial seed mix, as specified in the Nevada Final Guidelines for Successful Revegetation, and approved by the AO. Where applicable, disturbed areas will be rehabilitated as lek habitat. Temporary fences will be used to protect re-vegetated areas. Reseeding will be undertaken by the operator between the dates of October 1 and March 15.

19. All topsoil from all disturbances will be stockpiled for use in reclamation.

20. Vegetation that is removed will be stockpiled, shredded, and used as mulch during site rehabilitation. Any delay of reclamation for any reason, such as weather, must be approved by the BLM.

21. Drill hole cuttings will be returned to the hole if possible, or at a minimum, raked and spread out so as not to impede regrowth of vegetation or to create erosion problems.

22. The operator shall notify the AO the date rehabilitation operations commence and are completed.

23. A portable mud pit is recommended when drilling with fluids and will be required by the AO as needed to protect natural resources.

24. Regulations of the State Engineer under Nevada Administrative Code, Chapter 534A, Geothermal Resources will be followed.

25. A copy of these recommended operating procedures shall be kept by the party chief of each geophysical crew.

26. The operator may be required to have fire-fighting equipment available on-site while operations are in progress, depending on hazards inherent in the type of operation and fire hazard levels. The quantity and type of equipment will be specified by the AO. All uncontrolled fires will be reported immediately to the AO (775-885-6000).

27. Consultation with the U.S. Fish and Wildlife Service is required per section 7 of the Endangered Species Act if any proposed listed or listed threatened or endangered species or its critical habitat is likely to be affected by project activities. If, through consultation, there is deemed to be an adverse impact to a threatened or endangered species or its habitat, the proposal must be modified or denied.

28. Prior to surface disturbance, the Nevada Division of Wildlife will be consulted to determine how to avoid impacts to any special status species or critical habitat in the area proposed for geothermal resource development. If, through consultation, there is deemed to be an adverse impact to a threatened or endangered species or its habitat, the proposal must be modified or denied.

29. Actions which will adversely impact a plant or animal species or its habitat proposed for federal listing as threatened or endangered will be modified in order to prevent possible future listing of these species as threatened or endangered.

30. Surveys for BLM sensitive species will be conducted prior to initiating any ground disturbing activities.

31. Migratory bird inventories will be conducted for all proposed areas of disturbance or activity.

32. No surface use within 0.6 miles of known migratory bird nesting areas will be permitted in the nesting season, between March and June, or as determined for specific areas by the AO and with input from appropriate wildlife agencies.

33. Any identified bald eagle roost sites, peregrine falcon hack sites, and occupied raptor aeries (nests) will be avoided during geophysical operations. A ½-mile buffer zone will be imposed on all activities in these areas.

34. Measures to avoid impacts to Sage Grouse

    a. Prior to entry on any lease areas that include known or potential Sage Grouse habitat, lessee/operator shall contact the AO to discuss proposed activities.

    b. No surface occupancy will be permitted within 0.6 miles of any known Sage Grouse strutting grounds (leks).

    c. No surface use will be permitted within 2 miles of known Sage Grouse breeding areas during the breeding season, March through May, or as determined for specific areas by the AO and with input from appropriate wildlife agencies.

    d. No surface use will be permitted within 0.6 miles of known Sage Grouse nesting and brood rearing areas between April and August, or as determined for specific areas by the AO and with input from appropriate wildlife agencies.

    e. No surface use shall be permitted within 0.6 miles of known Sage Grouse winter range between October and March.

    f. Potential Sage Grouse habitat shall be avoided where possible, or if not possible, off-site mitigation to create habitat at least as suitable as the lost habitat, and at a replacement ratio of 2 to 1, shall be considered.

35. No surface use shall be permitted in crucial migratory routes or winter habitat for mule deer and antelope, between October 15 and April 15, or as determined for specific areas by the AO and with input from appropriate wildlife agencies.

36. Cultural resource inventories will be conducted on all proposed project routes or areas of potential surface disturbing impacts prior to authorization of the geophysical operations. Inventories will be completed by BLM or BLM-approved cultural resource permit holders and section 106 consultation will be completed.

37. All identified cultural resources will be avoided by project-related activities as per the Nevada BLM Programmatic Agreement for Cultural Resources. If avoidance is not feasible, geophysical activities must cease until mitigating measures are developed and implemented and Section 106 consultation is completed. Archaeological monitors may be required in special cases.

38. All traffic associated with geothermal exploration, development, production, and closeout must follow routes that avoid cultural resources. Flagging crews will identify and flag anticipated detours on the route, so that potential detours can be inventoried. The following may be excluded from cultural inventory requirements:

    - Operations located on constructed roads or well defined existing roads and trails;
    - Pedestrian routes and placement sites for hand-carried equipment;
    - One time pass routes of wheeled vehicles under 10,000GVW;
    - Helicopter-supported activities that do not require helicopter staging area preparation and use of off-roads and trails; and
    - Exploration activities defined as casual use in 43 CFR 3150.

    The decision to conduct a cultural clearance on projects involving methods listed above is at the discretion of the AO. All projects that include methods not listed above will require a clearance prior to their initiation.

39. Cultural resource clearance for projects will, at a minimum, involve one of the following types of inventories:

    - Class I: A review of existing historic documentation, and field station records. This type of inventory is generally used when the proposed project is located in an area of complete disturbance, or where the area has been previously inventoried using methods consistent with existing standards.
    - Class II: A review of existing historic documentation, and field station records and some fieldwork. This type of inventory is generally used when only a portion of the project area has been disturbed, or portions of the project area have been previously inventoried using methods consistent with existing standards. It may also include a determination of significance for cultural properties located within the project area, and a determination of effect.
    - Class III: A complete inventory that includes a review of existing historic documentation and field station records, and a complete inventory of the project area. It will also include an evaluation of significance for cultural properties located within the project area and a determination of effect. This type of inventory is used in areas where there have been no previous inventories, in areas where there has been a change in ground visibility, or the area was inventoried using methods not acceptable by existing standards.

40. The operator is responsible for informing all persons associated with the project that knowingly disturbing cultural properties (historic or archaeological) or collecting artifacts is illegal.

41. During winter geophysical operations, requirements for cultural resource inventories may be waived by the AO if the unsurveyed lines are located on bare and frozen ground or are completely covered (100%) by snow and the snow is sufficiently deep (approximately 4-6") to prevent ground disturbing ruts. Should conditions change while operations are in progress, the Operator must contact the AO to determine if an archaeological monitor or a Class III survey is required prior to continuance of geophysical activities.

42. For any geophysical operations occurring within ¼ mile of listed National Register Districts or National Register-eligible properties and districts, a Section 106 consultation for a Determination of Effect must be completed and mitigation measures developed and implemented prior to authorization.

Application for Permit to Drill (APD) and Sundry Notices

The regulations governing drilling operations on public lands are stated in 43 CFR 3260. With submittal of an APD or Sundry Notice by the operator or lessee, the following conditions of approval will be required for the operation, as applicable.

Pre-Construction

1. Existing roads should be used to the extent possible. Additional roads, if needed, shall be kept to an absolute minimum and the location of routes must be approved by the AO prior to construction.

2. Upon determination of an impending field development, a transportation plan will be requested to reduce unnecessary access roads.

3. All access roads will be constructed and maintained to BLM road standards (BLM Manual Section 9113).

4. Off-road travel will be restricted to terrain with less than 30 percent slopes, 20 percent if highly erodable, unless approved by the AO.

5. Proposed surface disturbance and vehicular travel will be limited to the approved well location and access route.

6. Any changes in well location, facility location, access, or site expansion must be approved by the AO in advance.

7. Prior to approval of an APD or other lease operations, a Section 106 consultation must be completed by the AO as provided for under the Nevada BLM Programmatic Agreement for Cultural Resources.

8. Any activity planned within a ¼-mile on either side the Pony Express National Historic Trail must undergo a visual assessment. Appropriate mitigation of visual impacts will be implemented as necessary to keep the management corridor in as natural a condition as possible.

Well Pad and Facility Construction

1. Every pad, access road, or facility site must have an approved surface drainage plan.

2. A site diagram depicting the location of production facilities, recontoured slopes and stabilization measures shall be approved by the AO prior to installation of production facilities.

3. The design of all facilities, including well pads, roads, pumps, and pipelines, shall be approved by the AO prior to construction to avoid unnecessary conflicts with visual resources management objectives.

4. Drainage from disturbed areas will be confined or directed so that erosion of undisturbed areas is not increased. In addition, no runoff water (including that from roads) will allowed to flow into intermittent or perennial waterways without first passing through a sediment-trapping mechanism. Erosion control structures may include: water bars, berms, drainage ditches, sediment ponds, or devices.

5. Access road construction for exploratory wells should be planned such that a permanent road can later be constructed in the event of field development.

6. Construction of access roads on steep hillsides and near watercourses will be avoided where alternate routes provide adequate access.

7. Access roads requiring construction with cut and fill will be designed to minimize surface disturbance and take into account the character of the landform, natural contours, cut material, depth of cut, where the fill material will be deposited, resource concerns, and visual contrast.

8. Fill material will not be cast over hilltops or into drainages. Cut slopes should normally be no steeper than 3:1 and fill slopes no steeper than 2:1.

9. Low water crossings should be used whenever possible. Installation of culverts, if necessary, will be designed to maintain the original stream gradient and will be of adequate size to accommodate a 24-hour 100-year event. Fill material will be properly compacted in layers not exceeding 6 inches in thickness to insure stability and to prevent

washing out or dislocation of the culvert. The road surface should not be less than 12 inches above the culvert to prevent crushing from weight loads.

10. As required, fill slopes surrounding culverts will be riprapped with a well-graded mixture of rock sizes containing no material greater than two feet or smaller than three inches. The ratio of maximum to minimum dimension of any rock shall not exceed 6:1.

11. Water turnouts needed to provide additional drainage will be constructed not to exceed two percent slope to minimize soil erosion.

12. Well site layout should take into account the character of the topography and landform. Deep vertical cuts and steep long fill slopes should be avoided. All cut and fill slopes should be constructed to the least percent slope practical.

13. Trash will be retained in portable trash cages and hauled to an authorized disposal site for disposal. Burning will not be allowed on the well site.

14. No drilling or storage facilities will be allowed within 650 feet of any pond, reservoir, canal, spring, or stream. Other protective areas near water may be required to protect riparian habitat and special status species.

15. As wells are drilled, the AO will require that the drilling company monitor the temperature and outflow of water from local hot springs. If the temperature and outflow of water from the hot spring is adversely impacted, AO will require the operator take corrective action, which may include amending or shutting down operations

16. Spring and water developments on public lands may be used only with the prior written approval of the AO or the water rights holder.

17. To maintain aesthetics values, all semi-permanent and permanent facilities will be painted to blend with the natural surroundings. Standard environmental colors will be used for color selection. Fences shall be made of non-reflective materials.

18. Fences shall not be cut without prior approval of the AO. Before cutting any fences, the operator shall firmly brace the fence on both sides of the cut; a temporary gate will be installed for use during the course of operations unless the fence is immediately repaired. Upon completion of operations, fences shall be restored to at least their original condition.

19. As directed by the AO, cattle guards will be installed whenever access roads are through pasture gates or fences. These cattle guards shall be maintained. This includes cleaning out under cattle guard bases when needed.

20. The depth of surface soil material to be removed and stockpiled will be specified by the AO. If topsoil is stockpiled for more than one year, the stockpile shall be seeded or

otherwise protected from wind and water erosion. The stockpile shall be marked or segregated to avoid loss or mixing with other subsurface materials. Any trees removed will be separated from soils and stockpiled separately.

21. Mud, separation pits, and other containments used during the exploration or operation of the lease for the storage of any hazardous materials shall be adequately fenced, posted, and/or covered.

22. Lessee/operator shall comply with all regulatory requirements for storage and handling of hazardous materials and wastes.

23. If historic or archaeological materials are uncovered during construction, the operator is to immediately stop work that might further disturb such materials, and contact the AO. Within five working days the AO will inform the operator as to whether:

    - the materials appear eligible for the National Register of Historic Places

    - the mitigation measures the operator will likely have to undertake before the site can be used (assuming in situ preservation is not necessary)

    - a timeframe for the AO to complete an expedited review under 36 CFR 800.11 or other applicable Programmatic Agreement, to confirm, through the State Historic Preservation Officer, that the findings of the AO are correct and that mitigation is appropriate

24. If the operator wishes, at any time, relocate activities to avoid the expense of mitigation and/or the delays associated with the process described in item 23 above for inadvertent discovery of cultural resources, the AO will assume responsibility for whatever recordation and stabilization of the exposed materials may be required. Otherwise, the operator will be responsible for mitigation costs. The AO will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the AO that the required mitigation has been completed, the operator will then be allowed to resume construction.

25. No surface use will be permitted within 0.6 miles of occupied raptor aeries (nests) during the nesting and fledging period.

26. Field development construction activities within 2 miles of a sage grouse lek will require motorized equipment to have noise abatement devices to preclude excessive noise during the sage grouse strutting period.

27. The cutting of rare, unique or unusual trees will not be permitted.

28. Consultation with the U.S. Fish and Wildlife Service is required per section 7 of the Endangered Species Act prior to approval of an APD or other lease operations if any proposed listed or listed threatened or endangered species or its critical habitat is likely

to be affected by project activities. If there is deemed to be any adverse impact, the proposal will be modified or the request denied.

29. Fences shall be flagged with bright colored flagging at least every rod for visibility to wild horses. All fences should be constructed using green steel posts with white or silver tops to increase visibility. Fences should also avoid obvious horse migration routes (deep trails, stud piles) if at all possible.

30. No access roads, drill pads, mud pits or storage facilities will be allowed within 500 feet of cave entrances, drainage areas and subsurface passages. No waste material or chemicals will be placed, or disposed of, in sinkholes or gates during specified time frames by cave entrances. If during construction activities any sinkholes or cave openings are discovered, construction activities will cease and the AO will be notified.

31. The discharge of dredged or fill material into surface waters such as navigable and interstate waters and their tributaries, wetlands adjacent to those waters and all impoundments of those waters may require an individual permit or notification under Section 404 of the Clean Water Act (CWA) issued by the District Engineer (DE) of the Corps of Engineers (COE). Criteria applied under Section 404 are established in regulation and will be used to determine the type of permit or notification required.

Field Operation

1. Operations shall be done in a manner that prevents damage, interference, or disruption of water flows, and improvements associated with all springs, wells, or impoundments. It is the operator's responsibility to enact the precautions necessary to prevent damage, interference, or disruptions. Monitoring wells may be required at all sites where exploration or development will occur to assess long-term impacts to quantity and quality.

2. Companies controlling roads that provide access into crucial wildlife areas may be required to close the road with a lockable gate to prevent general use of the road during critical periods of the year when resource problems are experienced (during hunting seasons, winter, etc.). This restrictive measure will be applied where needed to protect wildlife resources or to minimize environmental degradation.

3. The use of closed road segments will be restricted to legitimate, authorized agents of the lessee and/or their subcontractor(s), the land managing agency, and other agencies with a legitimate need (NDOW, other law enforcement agencies, etc.).

4. Unauthorized use or failure to lock gates during specified time frames by the lessee or its subcontractors will be considered a violation of the terms of the APD or associated grants.

5. The operator shall regularly maintain all roads used for access to the lease operation. A maintenance plan may be required. A regular maintenance program may include, but

not be limited to, upgrading of existing roads, blading, ditching, culvert and drainage installation, and graveling or capping of roadbed.

6. Management actions within riparian areas will be designed to maintain or, where possible, improve riparian habitat condition.

7. All power poles and potential raptor perches within a 2-mile radius of a potentially active sage grouse lek will include anti-perching devices, placed underground, or otherwise designed to eliminate use by raptors.

8. Noxious weeds that may be introduced due to soil disturbance and reclamation will be treated by methods to be approved by the AO. These methods may include biological, mechanical, or chemical. Should chemical methods be approved, the lessee must submit a Pesticide Use Proposal to the AO 60 days prior to the planned application date.

Reclamation and Abandonment

1. A water well may be accepted by the Carson City Field Office upon completion of operations. Please submit the following information to the Office:

    - Water Analysis
    - Type of inside diameter of casing used in well
    - Total depth of well
    - Depth of concrete seal
    - Depth of static water level
    - Water bearing formation or description of aquifer

2. The operator or contractor will contact the AO 48 hours prior to reclamation work.

3. Restoration work may not begin on the well site until the reserve pits are completely dry.

4. Disturbed areas will be recontoured to blend as nearly as possible with the natural topography prior to revegetation. This includes removing all berms and refilling all cuts. Compacted portions of the pad will be ripped to a depth of 12 inches unless in solid rock.

5. Site preparation for reclamation may include contour furrowing, terracing, reduction of steep cut and fill slopes, and the installation of water bars, etc.

6. All portions of the access roads not needed for other uses as determined by the AO will be reclaimed.

7. The stockpiled topsoil will be spread evenly over the disturbed area.

8. The operator will be required to construct water bars and re-open drainages on abandoned access roads and pipeline routes to minimize erosion as required. Water bars will be spaced appropriately dependent upon topography and slope. Pipeline routes shall be water-barred perpendicular to the fall line of the slope.

9. The area is considered to be satisfactorily reclaimed when all disturbed areas have been recontoured to blend with the natural topography, erosion stabilized and an acceptable vegetative cover has been established. The Nevada Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management and the US Forest Service will be used to determine if revegetation is successful.

10. Rehabilitation shall be planned on the sites of both producing and abandoned wells. The entire site or portion thereof, not required for the continued operation of the well, should be restored as nearly as practical to its original condition. Final grading of back-filled and cut slopes will be done to prevent erosion and encourage establishment of vegetation.

11. Petroleum products such as gasoline, diesel fuel, helicopter fuel, crankcase oil, lubricants, and cleaning solvents used to fuel, lubricate, and clean vehicles and equipment will be containerized in approved containers.

12. Hazardous material shall be properly stored in separate containers to prevent mixing, drainage, or accidents. Hazardous materials shall not be drained onto the ground or into streams or drainage areas.

13. Totally enclosed containment shall be provided for all solid construction waste including trash, garbage, petroleum products, and related litter will be removed to an authorized sanitary landfill approved for the disposal of these classes of waste.

14. All construction, operation, and maintenance activities shall comply with all applicable Federal, State, and local laws and regulations regarding the use of hazardous substances and the protection of air and water quality.

15. In construction areas where recontouring is not required, vegetation will be left in place wherever possible and the original contour will be maintained to avoid excessive root damage and allow for resprouting.

16. Watering facilities (e.g. – tanks, developed springs, water lines, wells, etc.) will be repaired or replaced if they are damaged or destroyed by construction activities to its predisturbed condition as required by the AO.

17. When sites are abandoned, they will be inventoried for the presence of noxious weeds and treated if noxious weeds are present.

18. Seed and mulch used to reclaim disturbed areas must be weed free. Mulching of the seedbed following seeding may be required under certain conditions (i.e. – expected severe erosion), as determined by the AO.

19. Seed will be broadcast between October 1 and March 15 using a site-specific seed mixture and depth of planting as determined by the AO. Seed may be applied with a rangeland drill at half the rate of broadcast seeding. All seeding application rates will be in pounds of pure live seed per acre. Seed should be adapted varieties.

APPENDIX E

GEOTHERMAL LEASE STIPULATIONS

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GEOTHERMAL LEASE STIPULATIONS

The following lease stipulations have been developed as mitigating measures for geothermal leasing and other reasonably foreseeable development activities with regard to geothermal exploration and development within the Carson City Field Office.

E.1 BUREAU OF RECLAMATION STIPULATION

The Lessor reserves the ownership of brines and condensates and the right to receive or take possession of all or any part thereof following the extraction or utilization by Lessee of the heat energy and byproducts other than demineralized water associated therewith subject to such rules and regulations as shall be prescribed by the Secretary of the Interior. If the Lessor elects to take the brines and condensates, the Lessee shall deliver all or any portion thereof to the Lessor at any point in the Lessee's geothermal gathering system after separation of the steam and brine products or from the disposal system as specified by the Lessor for the extraction of said brines and condensates by such means as the Lessor may provide and without cost to the Lessee. There is not obligation on the part of the Lessor to exercise its reserved rights. The Lessor shall not be liable in any manner if those rights are not exercised, and, in that event, the Lessee shall dispose of the brines and condensates in accordance with applicable laws, rules and regulations.

The Lessor reserves the right to conduct on the leased lands, testing and evaluation of geothermal resources which the Lessor determines are required for its desalinization research programs for utilization of geothermal fluids. These programs may include shallow temperature gradient hole underground exploration, if they are conducted in a manner compatible with lease operations and the production by Lessee of geothermal steam and associated geothermal resources. Lessor reserves the right to erect, maintain, and operate any and all facilities, pipelines, transmission lines, access roads, and appurtenances necessary for desalinization on the leased premises. Any desalting plants, piping, wells, or other equipment installed by the Lessor on the leased premises shall remain the property of the Lessor; and the Lessee shall conduct his operations in a manner compatible with the operation and maintenance of any desalting plants, piping, wells, or other equipment installed by the Lessor. Any brines and condensates removed by the Lessor shall be replaced without

cost to the Lessee with fluids as compatible with reservoir fluids as the brines or condensates that the Lessor removed and where the Lessor and Lessee determine that they are needed by the Lessee for his operation or for reinjection into the geothermal anomalies.

The Lessor and the Lessee, if authorized by law, may enter into cooperative agreements for joint development and production of geothermal resources from the leased premises consistent with applicable laws and regulations.

Any geophysical, geological, geochemical, and reservoir hydraulic data collected by either the Bureau of Reclamation or the Lessee will be made available upon request to the other party, and the data furnished to Reclamation by the Lessee shall be considered confidential so long as the following conditions prevail:

a. Until the Lessee notifies Reclamation that there is no requirement to retain the submitted data in confidential status or until Lessee relinquishes all interest in the leased area from where the information was obtained.

b. Reclamation shall not incorporate data received from the Lessee in its publications or reports during the period that confidential data are being retained without written authorization from the Lessee.

c. Information obtained by Reclamation, and upon request submitted to the Lessee, shall not be used in publications or reports issued by Lessee without written consent of Reclamation until the data have been published or otherwise given distribution by Reclamation.

The United States reserves the right to flood, seep and overflow the lands, permanently or intermittently, in connection with the operation or maintenance of the Newlands Project.

The Lessee will not interfere with the operation and maintenance of the Newlands Project. Prior to use of operation or maintenance roads within the Newlands Project, the Lessee will notify the AO in order to be appraised of areas that should be avoided to prevent interference with the operation and maintenance of the project. Reclamation will review all road or bridge crossing, piping or closure of any Newlands Project feature, and review NEPA and Cultural clearances on an individual basis.

There is also reserved to the United States, the right of its officers, agents, employees, licensees and permittees, at all proper times and places freely to have ingress to, passage over, and egress from all of said lands for the purpose of exercising, and protecting the rights reserved herein.

The Lessee further agrees that the United States, its officers, agents and employees and its successors and assigns shall not be held liable for any damage to the Lessee's improvements or works by reason of the exercise of the rights here reserved; nor shall anything contained in this paragraph be construed as in any manner limiting other reservations in favor of the Unites States contained in this lease.

The lands subject to this stipulation include all or part of the following lease sections:

Hazen KGRA and Noncompetitive Lease Area

- T. 20 N., R. 25 E., sections 02, 10, 12, 14, and 24
- T. 20 N., R. 26 E., sections 04, 06, 08, 16, 18, 20, 28, 30

Soda Lake KGRA and Noncompetitive Lease Area

- T. 20 N., R. 27 E., section 36
- T. 19 N., R. 28 E., sections 02, 03, 04, 06, 08, and 10
- T. 20 N., R. 28 E., sec. 02, 04, 08, 10, 12, 14, 16, 18, 24, 25, 26, 35, and 36
- T. 21 N., R. 28 E., sections 24, 26, 34, and 36
- T. 20 N., R. 29 E., sections 27, 28, 29, 30, 31, 32, 33, and 34

Salt Wells KGRA and Noncompetitive Lease Area

- T. 17 N., R. 30 E., sections 05, 08, 17, 20, and 32
- T. 18 N., R. 30 E., sections 19, 20, 29, 30, 31, and 32

Stillwater KGRA

- T. 19 N., R. 30 E., sections 05, 25, 26, 35, and 36
- T. 20 N., R. 30 E., section 35

E.2 US FOREST SERVICE STIPULATION

For leases within Forest Service lands, the lessee/operator must comply with all the rules and regulations of the Secretary of Agriculture set forth in Title 36, Chapter II of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of Interior in the lease/permit. The secretary of Agriculture's rules and regulations must be complied with for:

1. all use and occupancy of the NFS lands prior to approval of an exploration plan by the Secretary of Interior;
2. uses of all existing improvements, such as forest development roads, within and outside the area permitted by the Secretary of Interior; and

3. use and occupancy of the NFS lands not authorized by an exploration plan approved by the Secretary of Interior.

As a condition to the consent to the issuance of this lease, the Forest Service reserves the right to either consent to the approval of the surface use plan or the joint approval with the BLM of any surface operations conducted under the term of the lease.

On lands administered by the Forest Service, no occupancy or other surface disturbance will be allowed on slopes in excess of 40 percent.

Surveys for USFS sensitive species will be conducted prior to initiating any ground disturbing activities.

The Forest Service will be consulted with regarding the location of Sage Grouse strutting grounds (leks), and breeding, nesting, and brooding habitats. The distances and times that these areas will be avoided will be determined by the Forest Service.

The lands subject to this stipulation include all or part of the following lease sections:

Steamboat KGRA and Noncompetitive Lease Area

- T. 18 N., R. 19 E., section 36
- T. 17 N., R. 20 E., section 06

Aurora Crater Noncompetitive Lease Area

- T. 5 N., R. 28 E., sections 02, 03, 04, 05, 09, 10, 11, 15, and 16
- T. 6 N., R. 28 E., sections 13, 14, 22, 23, 24, 26, 27, and 28

E.3 MATERIAL SITE STIPULATION

The Lessee accepts this lease subject to the right of the State of Nevada to remove material from the land embraced in Material Sites and agrees that operations performed by the lessee will not interfere with operations of the State of Nevada, Department of Transportation.

The lands subject to this stipulation are described as:

- All potential KGRA and noncompetitive lease sections.

E.4 CONTINGENCY RIGHTS STIPULATION

BLM has reviewed existing information and planning resources documents and, except as noted in other attached stipulations, knows of no reason why normal development, subject to the controls of applicable laws and regulations and the lease terms and conditions, can not proceed on the leased lands. However, specific development activities could not be

identified prior to lease issuance since the nature and extent of geothermal resources were not known and specific operations have not been proposed. The lessee is hereby made aware that consistent with 43 CFR 3200.4, all post lease operations will be subject to appropriate environmental review and may be limited or denied only if unmitigatable and significant impacts on other land uses or resources would result.

The lands subject to this stipulation are described as:

- All potential KGRA and noncompetitive lease sections

E.5 SPECIAL STIPULATIONS FOR ALL LEASES IN CARSON CITY FIELD OFFICE MANAGEMENT AREA

The following mitigating measures are to be included as special stipulations on all geothermal leases issued in the Carson City Field Office Management area. The lessee shall comply with the following special conditions and stipulations unless they are modified by mutual agreement of the Lessee and the Authorized Officer (AO):

1. No surface occupancy or disturbance will be allowed within 650 feet (horizontal measurement) of any surface water bodies, riparian areas, wetlands, playas, or 100-year floodplains to protect the integrity of these resources (as delineated by the presence of riparian vegetation and not actual water). Exceptions to this restriction may be considered on a case-by-case basis if the BLM determines at least one of the following conditions apply: (1) additional development is proposed in an area where current development has shown no adverse impacts, (2) suitable off-site mitigation will be provided if habitat loss is expected, or (3) a plan of operations approved by the BLM ensures adequate protection of the resources. Other buffer zones and areas of restricted surface occupancy may be required to protect other resource values, including but not limited to, critical or rare or endangered species habitat.

2. Endangered Species Act Section 7 Consultation: The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modifications of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act, 16 USC § 1531 *et seq.*, as amended, including completion of any required procedure for conference or consultation.

3. To secure specific compliance with the stipulations under Section 6, paragraph (2) of the geothermal resources lease form, the lessee shall, prior to operations, furnish to the AO a certified statement that either no archaeological values exist or that they

may exist on the leased lands to be disturbed or occupied, to the best of the lessee's knowledge and belief, and that they might be impaired by geothermal resource operations. Such certified statement must be completed by a qualified archaeologist acceptable to the AO.

If the lessee furnishes a statement that archaeological values may exist where the land is to be disturbed or occupied, the lessee will engage a qualified archaeologist, acceptable to the AO, to survey and salvage, in advance of any operations, such archaeological values on the lands involved. The responsibility for the cost for the certificate, survey and salvage will be borne by the lessee, and such salvaged property shall remain the property of the Lessor or the surface owner.

4. Surface occupancy and use is subject to all valid existing surface rights.

The lands subject to this stipulation are described as:

- All potential KGRA and noncompetitive lease sections.

E.6 SPECIAL STIPULATIONS FOR SPECIFIC LEASES IN CARSON CITY FIELD OFFICE MANAGEMENT AREA

The following mitigating measures are to be included as special stipulations on geothermal leases issued for specific areas in the Carson City Field Office Management area. The lessee shall comply with the following special conditions and stipulations unless they are modified by mutual agreement of the Lessee and the Authorized Officer (AO):

No surface occupancy or use will be permitted on lands under lease pursuant to the Recreation and Public Purposes Act of 1926, as amended.

The lands subject to this stipulation are described as:

Steamboat KGRA and Noncompetitive Lease Area

- T. 18 N., R. 20 E., section 34
- T. 17 N., R. 19 E., section 12
- T. 17 N., R. 20 E., section 08

Wabuska Noncompetitive Lease Area

- T. 15 N., R. 25 E., section 22

No surface occupancy will be permitted on public lands surrounding the City of Fallon landfill, which are designated for disposal in the Resource Management Plan, unless specifically approved by the AO of the Carson City Field Office.

The lands subject to this stipulation include all or portions of:

Lee Hot Springs Noncompetitive Lease Area

- T. 16 N., R. 29 E., sections 20 and 21

No surface occupancy will be permitted on public lands within the boundaries of the proposed I-580 Federal Highways (FHWA)/Nevada Department of Transportation (NDOT) project. Other activities within this section will be closely coordinated with FHWA and NDOT to minimize impacts to the highway.

The lands subject to this stipulation include all or portions of:

Steamboat KGRA and Noncompetitive Lease Area

- T. 17 N., R. 19 E., section 12

No surface occupancy will be permitted on public lands in which BLM retains mineral rights but surface rights are held by private entities, so called "split-estate" lands.

The lands subject to this stipulation include all or portions of:

Steamboat KGRA and Noncompetitive Lease Area

- T. 18 N., R. 19 E., section 36
- T. 17 N., R. 20 E., section 06
- T. 18 N., R. 20 E., section 34

Surface occupancy or use will be coordinated with the Nevada Division of Wildlife for all lease activities within the Fernley State Wildlife Management Area in order to minimize impacts to wildlife management and recreational uses.

The lands subject to this stipulation include all or part of:

Hazen KGRA and Noncompetitive Lease Area

- T. 20 N., R. 25 E., sections 02, 06, 10, 12, 14, and 18

Surface occupancy or use will be coordinated with the US Fish and Wildlife Service and Nevada Division of Wildlife for all leasing activities within 1 mile of the Stillwater National Wildlife Refuge or and Stillwater Wildlife Management Area to minimize impacts to wildlife management and recreational uses.

The lands subject to this stipulation include all or part of:

Stillwater KGRA

- T. 19 N., R. 30 E., sections 25, 26, 35, and 36
- T. 20 N., R. 30 E., section 35

Surface use on Navy-withdrawn lands will be limited to a maximum height of 50 feet for all activities. All lease activities will be coordinated with US Navy, NAS Fallon.

The lands subject to this stipulation include all or part of:

Salt Wells KGRA and Noncompetitive Lease Area

- T. 18 N., R. 30 E., sections 19 and 30

Lee Hot Springs Noncompetitive Lease Area

- T. 15 N., R. 29 E., section 04, 09, 16, and 21

APPENDIX F

DISTRIBUTION LIST

APPENDIX F
DISTRIBUTION LIST

Person	Organization
Elected Officials	
Governor Kenny Guinn	State of Nevada Executive Chamber
Hon. Mike McGinness	State of Nevada Senate
Hon. James Gibbons	US House of Representatives
Hon. John Ensign	US Senate
Hon. Marcia De Braga	State of Nevada State Legislative Building
Hon. Harry Reid	US Senate
Federal Agencies	
Mike Andrews	US Bureau of Reclamation, Lahontan Basin Area Office
Cliff Creger	US Navy
Susan Elliott	US Forest Service, Humboldt-Toiyabe Nat'l Forest
Mike Goddard	US Fish & Wildlife Service
Robert Hunter	Bureau of Indian Affairs, Western Nevada Agency
Kathleen Lucich, Dist. Ranger	US Forest Service, Bridgeport Ranger District
Gary Schiff, District Ranger	US Forest Service, Carson Ranger District
Commanding Officer	US Navy
Field Supervisor	US Fish & Wildlife Service
State Agencies	
Dick Burdette	Public Utilities Comm. of NV
Alan R. Coyner	Nevada Division of Minerals
Heather Elliott	Nevada State Clearinghouse, Dept. of Administration
John Gebhardt	Nevada Division of Wildlife
Lisa Shevenell	NV Bureau of Mines & Geology
State of Nevada	Division of Wildlife

Person	Organization
Regional Agencies	
	Churchill County Board of Commissioners
	Lyon County Board of Commissioners
	Mineral County Board of Commissioners
	Washoe County Board of Commissioners
Native American	
James Birchim, Chair	Yomba Shoshone Tribe
Donna Cossette, Chair	Fallon Paiute-Shoshone Tribe
William Dancing Feather	Washoe Tribe, Cult. Res. Dept.
Elwood Emm, Chair	Yerington Paiute Tribe
Alan Mandell, Chair	Pyramid Lake Paiute Tribe
Arlan Melendez, Chair	Reno-Sparks Indian Colony
Robert Quinterro, Chair	Walker River Paiute Tribe
Tansey Smith	Fallon Tribe
A. Brian Wallace, Chair	Washoe Tribe of NV & CA
Individuals and Organizations	
Greg Arehart	Geological Sciences, UNR
Ron Barr	
Andre L. Beaupre	
Robert & Anne Louise Britton	
Ted J. Clutter, Executive Dir.	Geothermal Resources Council
Jim and Jean Combs	
Mark F. Coolbaugh	Great Basin Center for Geothermal Energy
Louie Damonte	Damonte Ranch LLC
Lissa Davis	NV Public Lands Access Coal.
Bill Ehni	Ehni Enterprises, Inc./Stillwater Holdings
William Barron Hilton	Hilton Family Trust, c/o Ernest Paine
Henry Hodges	Hodges Transportation, Inc.
Thomas L. Hutchings	
Steve King	
James M. Kingzett	
Steve Lyon	Lahontan Valley News
Joseph Marvel	
James P. Miner	Evergreen Energy LLC
Keith Penner	
Dale Ryan	National Pony Express Assn
Melissa Smith	
Raymond Talbott	Talbott Sheep Co.
James V. Taranik	Great Basin Center for Geothermal Energy
Donald G. Townsend	
William D. Washburn	
Mr. Charles Watson	N.O.R.A.
	Earth Power Resources, Inc.
	Empire Energy LLC
	Henkle & Associates

Person	Organization
	The Mule Deer Foundation
	NGP Power Corporation
	Nevada Cattlemen's Assoc.
	Nevada Mining Association
	Sierra Club, Toiyabe Chapter
	Vulcan Power Company
	Western States Geothermal Co.
	Yankee Caithness Jnt. Vent. LP