Leach

Magma Energy Action Plan for Geophysical and Vibroseis Surveys

Desert Queen and Leach Geothermal Areas

Submitted to:
Bureau of Land Management
Winnemucca Field Office

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1: Introduction

1.1 Overview of Project

Magma Energy has prepared this proposed action plan at the request of the Bureau of Land Management (BLM), Winnemucca Field Office (WMO) to describe proposed geophysical and vibroseis studies. The studies would be performed on the following leases:

- Desert Queen Area of Interest (AOI):
  - NVN-83928
  - NVN-86708
  - NVN-85709
- Leach AOI:
  - NVN-85722
  - NVN-85723
  - NVN-85724

The project locations are shown in Figure 1.1-1, and Figure 1.1-2

The proposed action would first include performing magnetic and gravity surveys across each project area. The second phase of this proposed action includes conducting vibroseis surveys on both areas. The purpose of both the geophysical and vibroseis surveys is to help better identify the location of the underground geothermal resource, which would allow for better planning and less drilling and associated disturbance during later exploration phases.

1.2 Environmental Process and Schedule

The first phase of work would be geophysical studies. Magma would perform the geophysical studies under Casual Use and would begin work about November 2008 and would take about 30 days to complete. Geophysical studies require very minimal to no ground disturbance. No new roads would be constructed.

The second phase of work would be vibroseis survey work, which would begin around the end of 2008 and into early 2009. Vibroseis can be conducted under a Categorical Exclusion, per the August 14, 2007 Federal Register, Section 11.9, since no new roads would be constructed. Vibroseis survey work would also take about 30 days to complete.

Geophysical and vibroseis activities are described in further detail in Section 2.

Figure 1.1-1: Leases in the Desert Queen Geothermal Area

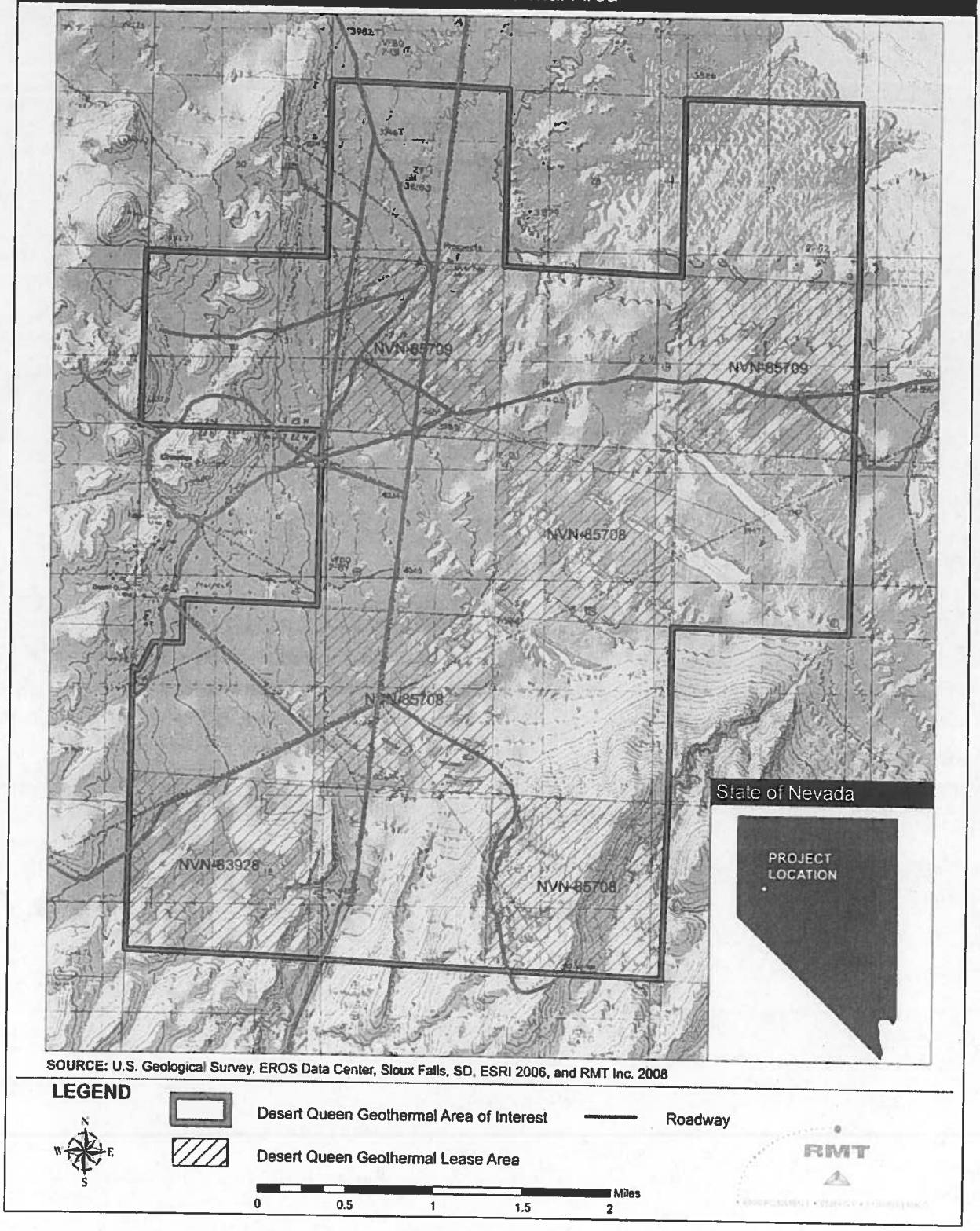
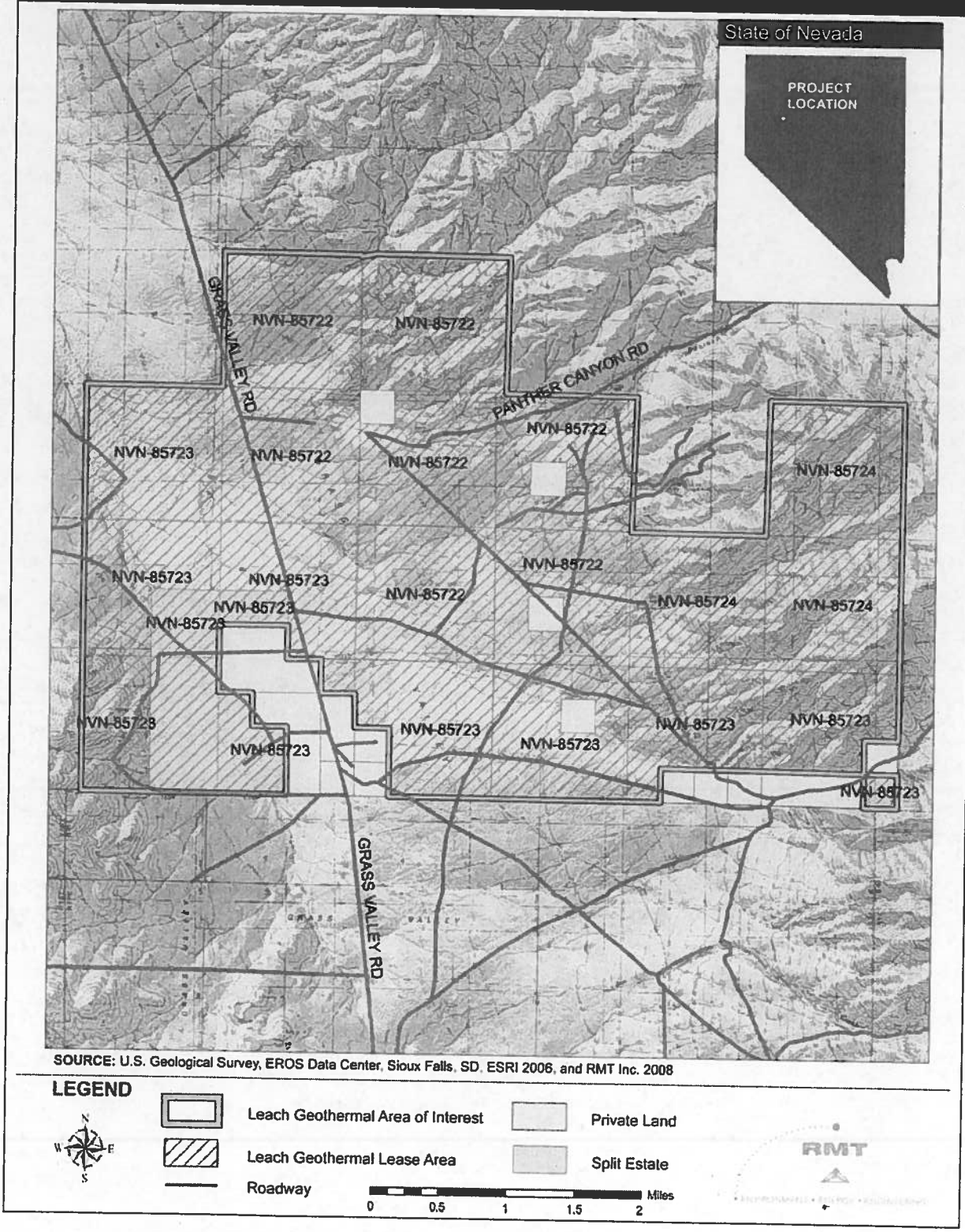


Figure 1.1-2: Leases in the Leach Geothermal Area



2: Proposed Action

2.1 Introduction

Magma Energy is proposing to conduct several different types of minimally invasive geophysical tests and vibroseis surveys on their geothermal leases in the Desert Queen and Leach geothermal areas. Each of these types of studies is described below.

2.2 Geophysical Surveys

2.2.1 Overview

Geophysical exploration methods are essential tools in locating and defining geothermal prospects. These non-invasive or minimally invasive techniques for acquiring such data are well established and generally result in high quality data that form the basis for early resource definition. The three general types of geophysical survey work that Magma is proposing to conduct include:

- Gravity Surveys
- Magnetic Surveys
- Electrical Field Surveys

Measurements for each of these surveys are all conducted on foot using techniques that have minimal to no environmental effects. Acquisition of data for all of these techniques is similar in that technicians carry the measuring devices (gravimeter, magnetometer, wires, batteries, and resistivity meters) into the field, and make the measurements over a period of minutes to up to 18 hours per site. The footprint for any given data station ranges in size from a few square inches, to less than 10 square feet. Under no circumstance are there lasting discernible changes to the ground surface.

2.2.2 Gravity Surveys

Gravity surveys include taking measurements of the gravitational field at a series of different locations over an area of interest. The objective in this exploration work is to associate variations with differences in the distribution of subsurface densities and hence rock types.

Surface gravity measurements are affected by several factors, including such things as the tidal forces generated by the moon, local topography and the ellipticity of the earth. These factors can generate changes in the measured gravity that is several orders of magnitude greater than those generated by the density variations in the underlying rocks. Compensation for these factors requires precise geographical survey precision. For a typical survey, the distance from the equator must be measured to within approximately 10 feet and the absolute elevation to within

about 1 inch. For small, localized surveys, topographic features within several hundred meters of the measurement location are considered. For more regional surveys, major topographic features (mountains, lakes, oceans) within a radius of 100 miles must be included in the data reduction procedures.

Equipment for gravity surveys includes a gravimeter and a handheld global positioning system (GPS) receiver. The gravimeter is a prism-shaped box approximately 20 inches tall, and 10 inches on each side.

A precise location is established within a few minutes using the GPS receiver. The technician places a triangle-shaped base on the ground and levels it using adjustable height feet. The gravimeter is placed on the base, and the measurement process is initiated. Values for the ambient force of gravity at that point are then acquired, usually within 2 to 4 minutes, after which the instrument and the base are removed. The only remaining evidence of the survey is footprints and three small indentations in the surface of the ground from the triangular base. Station spacing varies according to terrain and the need for greater or less resolution, but the average distance between stations is about 0.5 miles.

2.2.3 Magnetic Surveys

The process for measuring the terrestrial magnetic field is essentially the same as for gravity. The only difference is the magnetometer itself is a small (6 inches long by 3 inches in diameter) canister mounted on a lightweight aluminum pole that is approximately 1 inch in diameter and 8 feet tall. The pole is placed on the ground at the point where the GPS measurement was made. The instrument acquires data in approximately one minute and stores it internally for later processing. Station spacing varies according to terrain and the need for greater or less resolution, but the average distance between stations is about 0.5 miles.

2.2.4 Electric Current Surveys

Overview

Electrical field methods are based on measurement of either passive or induced electrical fields. Measurements can be made by passing instruments over the surface with no ground disturbance at all, or by placing electrodes (6 to 12 inches long and usually less than 0.5 inches in diameter) in the ground, connecting the electrodes by wires to an electrical metering device and observing the desired values (expressed in Ohm-meters, potential difference [volts], or amps). Passive surveys rely on natural electrical fields that are generated by a variety of mechanisms ranging from atmospheric storms, to groundwater flow, to charge variability in soils. Active surveys utilize introduction of an electrical current, measured in milliamps, usually by means of a 12-volt car battery. Measurement of the voltage difference between electrodes is then recorded by a voltmeter connected to the electrodes by above ground wires. The survey leaves only small ground disturbance (less than a few square inches) where electrodes were

temporarily inserted into the ground. The average distance between stations varies from 1,600 feet to 3,200 feet depending on how much resolution is needed to image the subsurface target(s). The types of electric current surveys include magnetotelluric (MT), and time-domain electromagnetic (TDEM). Each type of survey is described further below.

MT Surveys

MT is a type of electric field survey. It is used in the geothermal industry to obtain images of rock resistivity to depths of many thousands of feet below ground surface. MT surveys are used to map the difference in resistivity and thus temperature in clays that form above and within geothermal reservoirs.

Minimal equipment is needed to perform MT surveys. A set of MT equipment used to record a station consists of insulated wires attached to electrodes inserted into the ground, three coil magnetometers in PVC tubes about 48 inches long and 4 inches wide (two horizontally placed magnometers and one vertically placed magnometer), a recording system about the size of a piece of carry-on luggage, and a sealed battery. Figure 2.2-1 shows a typical layout of MT stations.

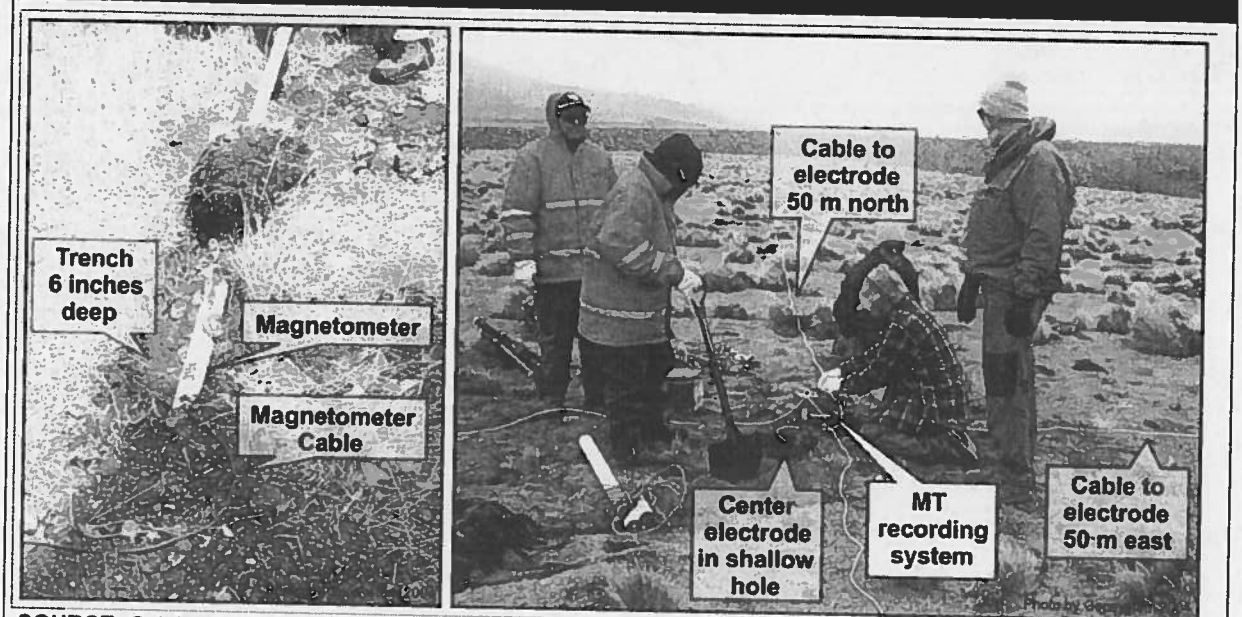
Insulated wires are laid out by hand in a plus-sign pattern and are electrically connected to the ground through electrodes of two possible types. Porous electrodes are usually buried in small holes about 6 to 12 inches deep and 6 inches wide using a hand held post-hole digger. In cases where it is difficult to achieve a good electrical contact with the rock or soil, a few quarts of fresh or slightly salty water and/or wet bentonite clay may be placed in the bottom of a hole dug for a porous electrode, or poured beside a steel stake. The steel electrodes are faster to install; however, the porous electrodes are electrically more stable and are required when recording for longer than an hour.

The two horizontal magnetometers are usually buried in two 48-inch long, 6-inch deep trenches and the vertical magnetometer is partially buried in a 24-inch deep hole dug with a post-hole digger to avoid wind vibration and resulting noise,. A plastic pail is placed over the protruding vertical coil of the magnometer to shield it from the wind.

The recording system is connected to the electrode wires and the magnetometer signal cables after the electrodes and magnetometers are installed, and the data is recorded. The system is usually left running unattended overnight to collect 14 hours of high-depth data. Depending on variations in the subsurface resistivity patterns, the spacing between MT stations may vary from several miles to a few hundred feet.

Survey operations are conducted by two or three independent crews, each consisting of two to five workers. It takes 20 minutes to an hour to lay out a station, 1 to 14 hours to acquire the data, and 30 minutes to pick up the station and move to the next station. Each crew carries one to three recording systems and can record two to six MT soundings per day, depending on access

Figure 2.2-1: Layout of a Typical MT Station



SOURCE: Calpine 2008

and recording duration. For recordings of 14 hours duration, the equipment is usually left running overnight at the station and picked up the next morning. All equipment can be carried by hand.

Station set-up locations can be adjusted to avoid sensitive resources.

TDEM

TDEM is another type of electric field survey. TDEM relies on electromagnetic induction between an undergrounded wire loop and the earth for both transmission and detection of signals. It requires no electrical contact with the earth, which means that it is not subject to the same types of distortion that can affect any method that measures the resistivity of the earth using electrodes, like MT. TDEM cannot detect resistivity patterns as deep as a geothermal reservoir but, because of its relative immunity to distortion, it reduces uncertainty in MT images.

TDEM survey equipment usually consists of a wire loop antenna, a transmitter/receiver unit, and a sealed battery. The loop antenna is a single strand of insulated wire laid out in a square pattern on the earth's surface, generally with a perimeter of 1,200 to 4,000 feet. A briefcase-sized transmitter/receiver unit is connected to one corner of the loop, and energizes the wire with a current from a sealed battery, or, in rare cases, a small gasoline generator. The same loop is used to both transmit and detect the signal response. A typical TDEM layout is shown in Figure 2.2-2.

Figure 2.2-2: Typical TDEM Survey Layout

SOURCE: Calpine 2008

Photo by Geosystem srl, Milan

The loop is normally laid out/retrieved by walking the footprint of the loop and laying out/recoiling the wire by hand. Depending on expected variations in the subsurface resistivity, the TDEM loops may be laid out as individual stations separated by up to several miles, usually at MT station locations or along continuous profile lines where the edge of one station coincides with an edge of an adjacent station. The TDEM survey requires no ground disturbance.

The TDEM transmitter loop is insulated, ungrounded, and the loop voltage and amperage is low in the type of geothermal TDEM survey planned. There is no electrocution hazard. Fire hazard is minimal, mainly related to a motor generator if one is used. Loops are not laid across roads to prevent vehicle tangle in the transmitter wire.

A crew of two to five workers conducts survey operations, usually using only one vehicle unless safe operation requires more. Depending on the size of loop used, it takes 15 minutes to an hour to lay out a station, 5 to 20 minutes to acquire the data, and 10 to 30 minutes to pick up the station. Three to nine TDEM soundings per day can be acquired by a single crew. In some cases, a TDEM system may be carried by an MT crew and recorded at the same location while setting up or removing the MT system.

Station set-up locations can be moved to avoid sensitive resources.

2.3 Vibroseis Surveys

2.3.1 Overview

The vibroseis surveys would involve the generation of ground vibration by vibroseis equipment along source points and the recording of reflected sound waves and patterns arising from the different underground geologic strata along receiver lines. The proposed source points are arranged into source lines that run perpendicular to the receiver lines.

2.3.2 Survey Lines

Vibroseis surveys would be preferentially performed along existing roads to the greatest extent feasible. Some additional off-road work may also be required. The existing road networks are shown in Figure 1.1-1 and Figure 1.1-2.

Prior to project commencement, physical surveyors mark the source and receiver lines and points to accurately define the extent and locations of project activities. A land survey crew locates and places temporary pin flags at receiver and source points using a high-accuracy GPS unit. This work is conducted on foot from existing access roads and trails. The survey crew works with a cultural resource professional to position all receiver and source point stations to avoid all known and apparent cultural resources, and natural and existing land use features. Surveyors also mark out lines that avoid drainage crossings that have a 5 foot or more elevation change. The final map of the location of the vibroseis lines will be provided to the BLM after survey work to identify the lines is completed, but prior to commencement of activities.

Source Points

Buggy vibrator trucks would generate the ground vibration for source points (Figure 2.3-1). Large acoustic vibrators mounted on trucks generate sound sources. A few sets of vibrators are used on the survey. The vibrators work in groups to help expedite the recording process. They do not cover the same ground but rather work on different ends of the source lines. The proposed project does not include drilling of holes (shot holes) or exploding charges.

The vibrators in each set are aligned front-to-back in a linear array. A central control truck stationed on an existing road and/or trail directs the vibrators. The vibrators generate a series of matched ground vibrations. Each vibrator places an approximately 4 x 8 foot pad, or base plate, on the ground and then vibrates synchronously with the other vibrators. . The frequency would range from approximately 6-8 hertz up to 120 hertz, subject to testing prior to the start of the survey. Each source point is vibrated four times (four sweeps), then the vibrators move ahead in equally spaced increments over the source lines. Only one pass over the source lines is necessary. The vibrators would traverse the seismic source lines and where required, pass along the receiver lines to access the next source line. Existing roads and trails would also be used, where possible, to access seismic source line. No new roads are proposed.

Figure 2.3-1: Vibroseis Vibrator Trucks/Buggies

SOURCE: Dawson 2004

No clearing or grading of the existing roads and trails is proposed; however, in some instances, brush and limbs overhanging a source line may be affected by the passage of buggies. While at a source point, vibrators would stay in place until all four sweeps are completed. At the end of each day, buggies would proceed to the designated staging or parking areas.

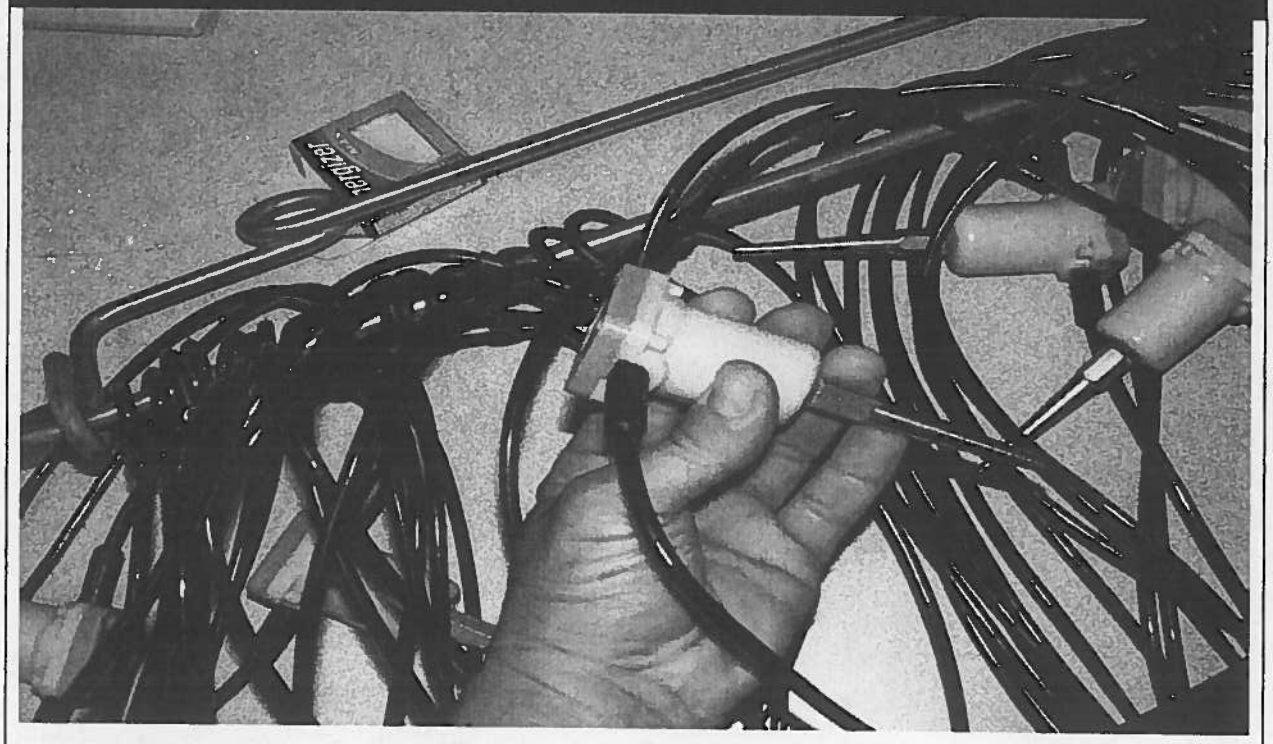
Source points have some flexibility to be moved from the established grid. The source points for the proposed project would be moved around sensitive resources such as migratory bird nests, burrowing owl burrows, and any identified cultural resources. More information about environmental controls is presented in Section 3.

Receiver Points

The acoustic energy from the base plates of the vibrators travels outward in a spherical wave front until it encounters an acoustic reflective surface at which point a small amount of the incident energy is reflected upward according to Snell's Law[1]. The remainder of the energy continues to penetrate the earth until it encounters another interface where the process is repeated. The reflected energy is recorded by an array of small geophones at the surface that are distributed along the receiver lines. Geophones are passive sensors that are 6 inches long and have a short spike on one end so that they can be pushed into the ground (Figure 2.3-2).

[1] Snell's Law describes the relationship between the angles and the velocities of waves. Snell's law equates the ratio of material velocities v1 and v2 to the ratio of the sines of incident and refraction angles.

Figure 2.3-2: Standard Geophone Receiver



SOURCE: Dawson 2004

Receiver locations include six geophones per station with a 3/8-inch cable connecting each station. The cables transmit digitized seismic data to a recording box located approximately every 1,000 feet along the receiver lines (Figure 2.3-3). No electrical current passes through the cables.

Receiver lines are accessed to deploy the receiver equipment. Recording equipment is transported to the field by pickup truck. Each receiver station and its six geophones are connected to the control vehicle through a cable connection between receiver stations. After recording in an "active" area of receiver lines, geophones, cable, and each station's equipment is retrieved and moved to a new receiver line. Disturbance from receiver lines is minimal and related to wires brushing the ground surface.

2.3.3 Staging

Two 2 acre (approximately 300 feet x 300 feet) sites for staging seismic survey activities would be used. The recording control truck containing the data collection equipment would be located on an existing road/trail or line to initiate the source shaking for the active receiver site locations during the vibroseis shaking. Staging areas are fenced with rented fencing and access is secured to prevent vandalism and theft of operations equipment and materials.

Figure 2.3-3: Recording Boxes and Cables from the Receiving System

SOURCE: Dawson 2004

2.3.4 Demobilizing

The demobilization task would proceed concurrently with data acquisition. All pin flags, flagging, and other "trash" would be gathered daily as the field groups and crew members complete data acquisition on portions of the project. The trash would be collected at points on roads or trails and transported by vehicle to staging areas where personnel would organize materials, handle equipment, and dispose of used/unusable materials. The staging area would be located in a level, fenced-in area, which would be positioned on previously disrupted land. This task would be completed within about 5 days after conclusion of the data acquisition task.

2.3.5 Workforce and Schedule

Approximately 35 crewmembers are needed to conduct daily operations, working 12 to 14 hours per day. Crewmembers would travel daily to the project area in the morning, complete data acquisition and initial decommissioning tasks, and return to town in the evening using several pickups and 15-passenger vans. As data acquisition efforts progress, field groups would periodically complete data acquisition tasks and would then move on to the decommissioning tasks. The same crew of approximately 50 people used in data collection is also used for demobilization. They travel daily to the project area in the morning and return to local motels in the evening using several pickups and 15-passenger vans.

The recording operations are anticipated to require about 30 days per site (i.e., Leach and Desert Queen) to collect all data. Demobilizing would take about 5 additional days.

3: Environmental Process

3.1 Overview of Environmental Process

3.1.1 Environmental Lease Requirements

The Desert Queen and Leach geothermal leases include several lease stipulations, as presented in Appendix A. All stipulations would be implemented as appropriate during geophysical and vibroseis survey efforts. A noxious weed control program and emergency response plan will be prepared prior to commencement of activities.

3.1.2 Native American Consultation

It is our understanding that the Winnemucca Field Office does not perform Native American consultation for Casual Use and Categorical Exclusion level work.

3.2 Geophysical Surveys

Geophysical studies would be performed as Casual Use. These activities have very minimal to no ground disturbance, often nothing more than what a hiker or recreationalist would generate. No new roads are proposed and all equipment can be carried by workers to sites. All stations are cleared immediately upon completion of the survey, which is usually within 18 hours of installation.

Environmental protection measures include providing an archaeologist to travel with the crew to each site to ensure that no archaeological or historic resources are disturbed. Any sites or artifacts found would be noted for future planning efforts.

Reclamation would include replacing soils and vegetation removed for installation of electrodes and magnometers, which is minimal. Soils would be stockpiled by the side of the excavation, so that the same topsoils can be filled back into the hole.

Surveys are expected to begin in November 2008. Surveys can occur in light snow.

3.3 Vibroseis Surveys

3.3.1 Categorical Exclusion

Vibroseis can be conducted under a Categorical Exclusion, per the August 14, 2007 Federal Register, Section 11.9, as long as no new roads will be constructed. Magma is not proposing to construct any new roads for vibroseis surveys.

3.4 Environmental Protection Measures included in Proposed Action

3.4.1 Overview

Several protection measures are included as part of the proposed action for the vibroseis survey work. These measures are described below.

3.4.2 Cultural Resources Protection

Cultural resource protection is included in this proposed action and includes having an archaeologist travel with the surveyors to explore areas for cultural resources before they are marked. If resources are found along the route, the route would be moved to an area clear of resources. The surveyor and archaeologist would mark the route a week or two prior to the actual survey.

Prior to commencement of each task of operations, employee briefings would be conducted to inform personnel of critical elements of compliance with the Archaeological Resources Protection Act (ARPA) and the National Historic Preservation Act (NHPA), along with pertinent BLM requirements and expectations concerning the protection of natural, cultural, and current approved land uses.

All employees and their contractors would be informed before commencement of Project operations that any effects on, defacement of, or removal and/or disturbance of archaeological, historical, or sacred material would not be permitted. Violation of the laws that protect these resources would be treated as law enforcement/administrative disciplinary action.

3.4.3 Migratory Birds and Sage Grouse Protection

The BLM has stated that the entire Winnemucca District is migratory bird territory. Migratory bird impacts are of highest concern in areas where there is surface water, such as at some of the sites in the Leach AOI. No survey locations would be located in waterways.

Magma would hire a biological monitor who would investigate the day's source and receiver transects for ground nesting birds at the start of each day. If any active nests are identified, a 250 foot exclusion zone would be marked off with visible tape or flags. The source points would be moved around the exclusion zone after the new path is surveyed and found to have no nests. Operations personnel would be instructed in pre-project meetings and employee briefings on how to minimize effects to birds.

The Leach AOI is known to include some sage grouse habitat. The Leach AOI may have wintering known populations. The following stipulations would apply if there are known leks in the project area:

- **Known Habitat**. Avoid all development or exploration activities within 3.3 km (2 miles) or other appropriate distance based on site-specific conditions, of leks, or within 1 km. (0.6 mi.) of known nesting, brood-rearing and winter habitat.
- **Known Breeding Habitat and Leks**. February through June, but may vary on site-specific basis. Avoid all activity within 3.3 km. (2 miles) of known leks during the mating season – March through May, or as determined by Field Office and Wildlife Personnel. No surface occupancy within 3.3 km (2 miles) of known leks at all times.
- **Nesting Habitat and Brood-rearing habitats:** (April through August per Interim NV Guidelines) and Winter Habitats: (October through March).

Magma will have biologists survey the project site for known leks prior to project commencement, in consultation with the BLM. If known leks are found in the Leach AOI, then the aforementioned stipulations would be implemented. A biologist would conduct the surveys to avoid known sage grouse leks.

3.4.4 Vibration and Noise

Vibration from the survey can have an effect on nearby structures. The vibrator buggies discharge acoustic energy into the ground starting at a frequency of about 10 cycles per second increasing up to about 100 cycles per second for a period of six to eight seconds. During the first part of the sweep, the low frequency portion, the greatest amount of particle movement occurs. Particle movement is also known as vibration and is measured in peak particle velocity (PPV). The US Bureau of Mines sets a threshold for PPVs generated by equipment near structures in order to maintain structure integrity. PPV should be maintained below 0.5 inches per second (in/sec) to prevent damage to nearby structures with plaster walls and 0.75 in/sec for drywall construction (US Bureau of Mines 1980). These are overly conservative values given that the duration of vibrations induced by vibroseis are very short. A PPV study was performed by Ameridian Technologies in Eddy County, New Mexico in December 2003 for the vibroseis equipment that would be used on the proposed project. The study showed that PPVs are about 0.85 in/sec within 10 feet of the source, but quickly taper to about 0.45 in/sec at 40 feet.

No source points within approximately 300 feet (91 meters) of foundations, buildings, utilities, or other structures. This distance meets the standards of the BLM for protection of structures (BLM Handbook H-3050-1).

3.4.5 Other Environmental Protections

Biological Resources

1. All equipment, including on-road and off-road equipment, would be cleaned to remove weed seed and soil (may contain weed seed) prior to commencing operations on public lands within the Project Area.

2. Larger shrubs, trees, and other obstacles would be avoided where possible; no cutting or removal of shrubs, trees, or other obstacles is proposed.
3. Buggy vehicles would leave, approach, and cross existing roads at low angles to the road to not provide a view of the buggy two-track leading away from the existing road, which in some cases might entice future ORV use of the seismic survey buggy routes and cause continuing compression and possible damage of vegetation in the two tracks.

Hazards and Hazardous Materials/Human Safety

1. Fuel and lubricants would be temporarily stored in transportable containment trailers at locations within staging areas to minimize potential for accidental releases/spills. No other hazardous or potentially hazardous materials would be brought into the Project Area.
2. All spills or leaks of diesel fuel, hydraulic fluid, lubricating oil, and coolant, including contaminated soil material, would be excavated to an appropriate container and transported to the nearest licensed disposal site.
3. All solid waste or trash would be transported for disposal to an approved solid waste disposal facility site.
4. All vehicles would be equipped with fire extinguishers and shovels.
5. All brush build-up around mufflers, radiators, headers, and other engine parts must be avoided; periodic checks must be conducted to prevent this build-up.
6. Smoking would only be allowed in company vehicles and/or designated smoking areas; all cigarette butts would be placed in appropriate containers and not thrown on ground or out windows of vehicles.
7. Cooking, campfires, or fires of any kind would not be allowed.
8. Portable generators used in the Project Area would be required to have spark arresters.

Topography, Geology, Soils and Minerals

1. Vibrator buggy traffic would be planned to minimize the number of passes over the same ground, to minimize the potential for soil compaction.
2. Staging area would be located on previously disrupted land. Any minor compacted portions of staging areas would be scarified and seeded per BLM requirements upon completion of the project and prior to the next growing season. Other areas, as determined on a case-by-case basis by the authorized officer, would be re-seeded to provide soil protection, forage, and to deter future ORV use.
3. The spinning of all vehicle tires would be avoided where possible to minimize the potential for soil displacement.

Recreation

1. Safety-warning signage would be placed at entrances of main access roads to make the public aware of road traffic related to the project activities.
2. Vibrator buggy operations would be preceded and followed by flagmen whose purpose would be to notify the public of vibrator buggy activity ahead.
3. Survey crew/staff would keep the public a safe distance away from all buggy activity.
4. Temporary signs would be placed along roads to warn the public of off-road travel in areas of off-road buggy activity.

3.5 Surface Reclamation Methods

Vibroseis would first occur along existing road networks. There may be some off-road work as well. Reclamation of those areas would be accomplished by removing all project-related materials, by scarifying any compacted areas to loosen the soil and to enhance revegetation success, and by broadcast-seeding of the scarified areas and any denuded areas with an approved BLM seed mix, if appropriate.

APPENDIX A

Lease Stipulation Matrix

Stipulation Topic	Stipulation Description	NV-08-08-004 Desert Queen	NV-08-08-005 Desert Queen	NV-08-08-018 Leach	NV-08-08-019 Leach	NV-08-08-020 Leach	NV-08-08-022 McCoy	NV-08-08-023 McCoy
Water Resources	As exploration and development activities commence, the operator shall institute a hydrologic monitoring program. The details of the monitoring programs will be site specific and the intensity shall be commensurate with the level of exploration. For example, if the proponent will be conduction seismic studies the monitoring would be limited to the identification of water resources to be monitored as activities continue; if a drilling program were to be undertaken the number of aquifers encountered, their properties, their quality, and their saturated thickness would be documented. The information collected will be submitted to the Bureau of Land Management and will be used to support future NEPA documentation as development progresses. Adverse impacts to surface expressions of the geothermal reservoir (hot springs), and Threatened and Endangered Species habitat are not acceptable. The lessee will monitor the quality, quantity, and temperature of any hot springs or other water resource within the project area whenever they are conducting activities which have the potential to impact those resources. If adverse impacts do occur, BLM will require the lessee to take corrective action to mitigate the impact. Corrective action may include shutting down the operation. These are addition to the other stipulations. These are LEASE stipulations, not operational; the information gathered under the monitoring stipulation will be used to identify future impacts at the operational stage.	X	X	X	X	X		
Hazardous Materials	Prior to exploration and development, an emergency response plan will be developed to include contingencies for hazardous material spills and disposal.	X	X	X	X	X		
Native American	Controlled Or Limited Surface Use: (avoidance and/or mitigation measures to be developed). All development activities proposed under the authority of this lease are subject to the requirement for Native American consultation prior or BLM authorizing the activity. Depending on the nature of the	X	X	X	X	X		

Stipulation Topic	Stipulation Description	NV-08-08-004 Desert Queen	NV-08-08-005 Desert Queen	NV-08-08-018 Leach	NV-08-08-019 Leach	NV-08-08-020 Leach	NV-08-08-022 McCoy	NV-08-08-023 McCoy
	lease developments being proposed and the resources of the concern to tribes potentially affected, Native American consultation and resulting mitigation measures to avoid significant impacts may extend time frames for processing authorization for development activities, as well as, change in the ways in which development are implemented. For development and production phases, surface occupancy may be limited to a specific distance or precluded at hot springs, pending conclusion of the Native American consultation process.							
Noxious Weeds	During all phases of exploration and development, the lessee shall maintain a noxious weed control program consisting of monitoring and eradication for species listed on the Nevada Designation Noxious Weed List (NRS 555.010).	X	X	X	X	X		
Cultural Resources	**No Surface Occupancy:** No surface occupancy within the setting of National Register eligible sites where integrity of setting is critical to their eligibility.	X	X	X	X	X		
Migratory Birds	Surface disturbing activities during the migratory bird nesting season (March to July) may be restricted in order to avoid potential violation of the Migratory Bird Act. Appropriate inventories of migratory birds shall be conducted during analysis of actual site development. If active nests are located, the proponent shall coordinate with BLM to establish appropriate protection measures for the nesting sites which may include avoidance or restricting or excluding development during certain areas to times when nests and nesting birds will not be disturbed. During development and production phases, if artificial ponds potentially detrimental to migratory birds are created, these shall be fitted with exclusion devices such as netting or floating balls	X	X	X	X	X		
Vegetation	**Controlled Or Limited Surface Use:** (avoidance and/or mitigation measures to be developed). All areas of exploration and or development disturbance will be reclaimed including re-contouring disturbed areas to blend with the surrounding	X	X	X	X	X		

Stipulation Topic	Stipulation Description	NV-08-08-004 Desert Queen	NV-08-08-005 Desert Queen	NV-08-08-018 Leach	NV-08-08-019 Leach	NV-08-08-020 Leach	NV-08-08-022 McCoy	NV-08-08-023 McCoy
	topography and using appropriate methods to seed with a diverse perennial seed mix. The seed mix used to reclaim disturbed areas would be "certified" weed free.							
Threatened, endangered or sensitive species	**Controlled Or Limited Surface Use:** (avoidance and/or mitigation measures to be developed) 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 modification to exploration and development proposals to further it 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 is obligation under applicable requirements of the Endangered Species Act, 16 U.S.C. 1531, as amended, including completion of any required procedure for conference or consultation.	X	X	X	X	X		
Riparian Areas Stipulation	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 disturbance will be allowed within 650 feet (horizontal measurement) of any surface water bodies, riparian areas, wetlands, playas, or 100-year floodplain 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)						X	X

Stipulation Topic	Stipulation Description	NV-08-08-004 Desert Queen	NV-08-08-005 Desert Queen	NV-08-08-018 Leach	NV-08-08-019 Leach	NV-08-08-020 Leach	NV-08-08-022 McCoy	NV-08-08-023 McCoy
	BLM determines development proposed under any plan of operations ensure adequate protection of the resources.							
Native American Consultation Stipulation	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): All development activities proposed under the authority of this lease are subject to the requirement for Native American consultation prior to BLM authorizing the activity. Depending on the nature of the lease developments being proposed and the resources of concerns to tribes potentially effected, Native American consultation and resulting mitigation measures to avoid significant impacts may extend time frames for processing authorization for development activities, as well as, change in the ways in which developments are implemented.						X	X
Controlled or Limited Surface Use	(avoidance and/or mitigation measures to be developed). All surface disturbing activities proposed after issuance of the lease are subject to compliance with Section 106 of the National Historic Preservation Act (NHPA) and its implementation thought the protocol between the BLM Nevada State Director and the Nevada State Historic Preservation Officer.		X	X	X	X		
Wild horse and burros	**Controlled or Limited Surface Use:** (avoidance and/or mitigation measures to be developed.) If wild horse burro populations are located on sites proposed for development, it may be necessary to avoid or develop mitigation measures to reduce adverse impacts to horses. These measures may include providing alternative water sources for horses of equal quality and quantity.			X	X	X		
General Sage Grouse Stipulations	Prior to entry on any lease areas which include known or potential habitat, the lessee (operator) shall contact the appropriate BLM Field Office to discuss any proposed activities.			X	X	X		
Lands & Realty	No drilling, including exploration or development activities			X	X			

Stipulation Topic	Stipulation Description	NV-08-08-004 Desert Queen	NV-08-08-005 Desert Queen	NV-08-08-018 Leach	NV-08-08-019 Leach	NV-08-08-020 Leach	NV-08-08-022 McCoy	NV-08-08-023 McCoy
	within linear Rights-of-Way							
Sage Grouse	The following stipulations apply to protect sage grouse and their habitat. Known habitat is defined as those areas where sage grouse have been observed. Potential habitat is an area where sage grouse may occur. **Known Habitat:** Avoid all development or exploration activities within 3.3 km (2 miles) or other appropriate distance based on site-specific conditions, of leks, or within 1 km. (0.6 mi.) of known nesting, brood-rearing and winter habitat.			X	X	X		
Sage Grouse	The following stipulations apply to protect sage grouse and their habitat. Known habitat is defined as those areas where sage grouse have been observed. Potential habitat is an area where sage grouse may occur. **Known Breeding habitat and Leks:** February through June, but may vary on site specific basis. Avoid all activity within 3.3 km. (2 miles) of known leks during the mating season – March through May, or as determined by Field Office and Wildlife Personnel. No surface occupancy within 3.3 km (2 miles) of known leks at all times.				X	X		
Sage Grouse	The following stipulations apply to protect sage grouse and their habitat. Known habitat is defined as those areas where sage grouse have been observed. Potential habitat is an area where sage grouse may occur. **Nesting Habitat and Brood-rearing habitats:** (April through August per Interim NV Guidelines) and Winter Habitats: (October through March).				X	X		