Appendix C: Greater Sage-Grouse Monitoring and Mitigation Plan

APPENDIX C

Greater Sage-Grouse Monitoring and Mitigation Plan for McGinness Hills Geothermal Development Project

C.1 MITIGATION MEASURES TO ADDRESS ANTICIPATED PROJECT IMPACTS

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

The following measures (developed in consultation with the NDOW), required to mitigate anticipated Project effects to greater sage-grouse, would begin to be implemented in concert with the initiation of Project construction, where appropriate Other mitigation measures should be implemented over the life of the project as monitoring indicates the need for mitigation implementation, as determined by the BLM and USFS.

It should be noted that while a large portion of the impacted sage-grouse habitat is located on lands managed by the BLM, there is sage-grouse habitat proximate to the USFS proposed transmission line route. It should also be noted that known sage-grouse leks are located on both agencies' lands. However, it is presumed that not all leks have been identified. Thus all mitigation discussions apply to both agencies lands for sage-grouse mitigation when identified.

As noted in Chapter 3 of this EA, all BLM/USFS clearances, including Section 106 of the NHPA, Native American Consultation, ESA and SSS clearances, along with migratory bird requirements will be completed prior to implementation of any sage-grouse habitat restoration/ enhancement projects.

C.1.1 MITIGATION OF DIRECT EFFECTS ASSOCIATED WITH THE GEOTHERMAL COMPONENTS AND TRANSMISSION LINE

Key Issues for Sage-Grouse

Impacts to sage-grouse include the loss of 217 acres of sage-grouse foraging and nesting habitat , including potential Category 1 habitat as defined by Nevada's Governor Sage-Grouse Conservation Team (NGSCT, 2010), resulting from direct and/or long-term surface disturbance associated with Project construction and operation. Effects of habitat fragmentation from this habitat loss would be concentrated around the plants, production and injection pipelines, and wells.

Mitigation Measures

Ormat will complete, at a 4:1 ratio (NGSCT 2010), terrestrial habitat restoration/enhancement, and improvements to compensate for disturbance in sage-grouse habitat in the vicinity of the Project (Figure 1). Ormat will fund all restoration and enhancement projects to BLM and/or USFS specifications, following all BLM/USFS requirements.

At a 4:1 ratio, this equates to 868 acres (4 x 217 acres) of habitat restoration/enhancement. The potential or likely treatment areas to be restored/enhanced include BLM/USFS-managed lands within the vicinity of the Project area, as shown in Figure 1. These potential treatment areas will be identified on a case-by-case basis, based on field inventory of habitats, conditions, and potential value to sage-grouse as well as indications of effects to sage-grouse based on monitoring results. A preference will be given to areas in close proximity to the Project, but outside a 2-mile buffer around the project, thus minimizing any conflicting indirect effects of Project operation, testing, or maintenance. Preference for habitat restoration/enhancement treatment areas will also be given to locating restoration/enhancement in NDOW-designated sage-grouse core-breeding habitat (Figure 14 in the EA as denoted in light blue). While the project will directly and indirectly impact core-breeding habitat, the goal of the restoration/enhancement efforts will focus on entire habitat throughout the life cycle of sage-grouse. Habitat enhancement/restoration treatments will be prescribed for specific sites based on the probability of successful restoration/enhancement and the greatest benefit to local sage-grouse metapopulations (i.e., a group of spatially separated populations of the same species, which interact at some level). The determination of where a specific restoration/improvement/enhancement project is located and when work would be conducted would rest with the BLM/USFS to allow for incorporation of applicable study or monitoring data and identification of areas with the best habitat potential. Prior to implementation of these various or potential treatment options (and after an area is designated for treatment) cultural surveys and Native American Consultation/Coordination will be completed per BLM/USFS protocols.

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

Restoration/enhancement projects could be completed in R-1, R-2, R-3, or R-4 value habitats (NGSCT 2010). These R-values are restoration habitats defined from the "Energy and Infrastructure Development Standards to Conserve Greater Sage-Grouse Populations

and Their Habitats in Nevada" produced by the Nevada Governor's Sage-Grouse Conservation Team 2010. Below are the descriptions for the associated R-values:

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

Treatments may include the following:

- **Burn restoration (historic burns) including: seedings (sagebrush and understory vegetation via broadcast, broadcast and harrow, drill or hand planting of seedlings), noxious and invasive plant treatment (Plateau® for cheatgrass and other herbicides as needed for other invasive and/or noxious weed species), and possible temporary fencing to protect areas of restoration.**
- **Brush thinning via mechanical methods, herbicide or hand thinning followed by seeding (seeding to be done via broadcast or drill methods) to increase the diversity in monotypic sagebrush habitats;**
- **Mechanical or hand shrub thinning or green stripping to reduce fuels and fire risk to sage-grouse habitats followed with successful seeding (seeding to be done via broadcast or drill methods);**
- **Weed treatment followed with successful seeding (seeding to be done via broadcast or drill methods);**
- **Pinyon-juniper reduction by hand thinning areas in which shrubs are still the dominant form (phase I pinyon-juniper woodland) or are co-dominant (early phase II pinyon-juniper woodland).**

Monitoring and Trigger Points

Implementation of the above 4:1 land treatment options would be a requirement of the BLM/USFS approval of Ormat's various applications for the McGinness Hills Geothermal Development Project. For this aspect of the mitigation plan, the BLM/USFS, working with the NDOW have determined through the NEPA process that the loss of 217 acres of sage-grouse habitat will require 4:1 replacement (by enhancement and/or restoration of nearby habitat) of that lost habitat. The trigger points for implementation and location of habitat

restoration/enhancement projects will be based on monitoring (see section C.2) and identified impacts of the project proposal.

Effectiveness of Proposed Mitigation

These measures will improve sage-grouse habitat to substitute and offset the habitat lost through Project development (IM 2008-204). Increasing the quality and the quantity of sage-grouse habitat will benefit not only individuals but also the local population.

Restoration of burned areas will in time return those areas to sage-grouse habitat. Without sagebrush, the birds are less likely utilize or at best have limited use of the burned areas. Increasing the quality of the habitat through sagebrush and understory seedings, individuals are expected to once again utilize the areas.

Monotypic sagebrush habitats do not provide high valued habitat as they lack the majority, if not all, of the perennial understory. Breeding habitat should contain a sagebrush cover of 15-25% with greater than 15% for grasses and greater than 10% for forbs; winter habitat having sagebrush cover ranging from 10 to 30% (Connelly et al. 2000). By thinning sagebrush canopy cover to the desired amount and seeding the interspaces with desired native forbs and grasses, the habitat quality should increase. By green stripping and brush thinning to create fuel breaks, the likelihood of a catastrophic fire is reduced, in turn, protecting existing and potential enhanced/restored sage-grouse habitat.

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

Pinyon –juniper woodlands are expanding and encroaching into sagebrush communities throughout the Great Basin (Miller et al. 2008). This expansion and encroachment leads to a reduction in viable sage-grouse habitat. Hand thinning early phases of expansion/encroachment would return areas previously used by sage-grouse to quality habitat.

In order to protect the restored or enhanced habitat, temporary fencing may be used. Once restoration/enhancement objectives, as identified above, are achieved, these fences will be removed.

Mitigation Impacts

Ormat's financial contributions that ensure the sage-grouse habitat will be replaced at a 4:1 ratio will have some financial impact to Ormat.

Any herbicide treatments for invasive or noxious weeds shall be completed within the constraints of the Battle Mountain Programmatic Weed Environmental Assessment (2009). Vegetation reseeding using mechanical means will result in some level of soil disturbance. Appropriate clearances prior to implementation of the reseeding efforts will avoid potential impacts to other resources. Successful establishment of vegetative understories and sagebrush communities over

time will provide quality habitat restoration and enhancement for sage-grouse and sage-grouse broods, which should ensure propagation of the local populations.

Burned area reseeding of grasses, forbs and sagebrush seedlings and fencing such restoration habitat will re-establish sage-grouse habitat over time. The restored areas will provide additional quality habitat, thus allowing sage-grouse populations to re-establish formerly destroyed habitats.

Fencing of restored/enhanced habitat, depending on the size of the project, could reduce a portion of the grazing permittee's carrying capacity. Agreements for fencing with the permittee/s will be required prior to fencing such projects. Ormat will be required to maintain all restoration/enhancement project fences.

Hand thinning of pinion/juniper expansion and encroachment into sage-grouse habitat will have a positive effect on sage-grouse habitat since both types of trees limit understory growth. Removal of individual trees will limit competition for nutrients and water, thus providing opportunities for understory growth.

Where prescribed, hand thinning will be conducted by Individuals on foot, using chainsaws and handsaws to remove individual trees. Trees may be left on the ground to decompose naturally over time, providing microsites for establishment of desirable plant species and habitat for small animals such as rabbits and mice.

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

The changes in sage-grouse habitat by increasing diversity through seeding, seedlings, plantings, etc. will improve habitat quality, reduce the potential for plant disease, and improve sage-grouse propagation and survivability.

C.1.2 MITIGATION OF PREDATION EFFECTS ASSOCIATED WITH THE TRANSMISSION LINE

Key Issues for Sage-Grouse

The primary impact from the proposed transmission line is the increased predation risk due to an increased presence of common ravens and other avian predators resulting from added perching and nesting sites associated with the transmission line.

Mitigation Measures

The Project would require the implementation of the Common Raven Monitoring, Mitigation, and Management Plan (Appendix D). This plan includes the following mitigation measures:

- **During all phases of the Project (i.e., construction and maintenance), all food, waste, and trash will be placed in closed containers.**
- **Ormat will prohibit employees, contractors and sub-contractors from feeding wildlife or leaving food available for scavenging wildlife.**
- **Road-killed animals on the Project site and associated travel routes will be promptly removed and disposed of in closed containers to eliminate access to ravens.**
- **Presence of road-killed animals will also be minimized by Ormat's environmental protection measure of a maximum 25 mph speed limit within the Project area.**
- **Ormat has committed to implement the following environmental protection measures: perch and nest deterrents on all power poles; singlepole transmission line design (APLIC 2006).**
- **Ormat will acquire common raven depredation permits from NDOW or USFWS.**

Monitoring and Trigger Points

For all aspects of the monitoring plan for sage-grouse impacts, refer to Section C.2. This mitigation is required; there are no trigger points.

Effectiveness of Proposed Mitigation

These measures will lead to a decreased presence of common ravens and other avian predators within the vicinity of the project, thereby decreasing predation risk to sage-grouse. Travel speeds of <25 mph will also decrease the probability of collisions with animals.

Mitigation Impacts

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

Acquiring depredation permits will add to Ormat's ability to maintain lower numbers of ravens. In turn, this reduction will lower potential predation on sage-grouse by ravens.

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

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

C.1.3 MITIGATION OF INDIRECT EFFECTS TO SAGE-GROUSE LEKS FROM GEOTHERMAL PROJECT CONSTRUCTION, TESTING, AND MAINTENANCE

Key Issues for Sage-Grouse

Indirect effects to sage-grouse during lekking season resulting from noise, visual intrusion and human activity associated with geothermal project construction, testing, and maintenance.

Mitigation Measures

- **Ormat will ensure that timing of shift changes and deliveries will be scheduled outside the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).**
- **Venting pressure or steam to the atmosphere (e.g., during well or flow testing) would occur outside the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).**
- **Construction or maintenance activities (including helicopter fly-overs) associated with well pads, pipelines, transmission lines, plant facilities, and roads will not be permitted within two miles of active leks (see Sage-Grouse Population Monitoring below) during the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).**
- **Noise generated by the Project will be managed so that sound pressure levels will be below 49 dBA (MTSGWG 2005, NDGFD 2005, WYSGWG 2006) at active leks (see Sage-Grouse Population Monitoring section below) during the lekking period (15 March – 15 May, 1 hour before sunrise–10:00 AM).**

Monitoring and Trigger Points

For all aspects of the monitoring plan for sage-grouse impacts, refer to Section C.2. This mitigation is required; there are no trigger points.

Effectiveness of Proposed Mitigation

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

Mitigation Impacts

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

The requirement to vent steam outside of the prescribed times may delay testing procedures for Ormat. Since such test procedures are usually longer than twenty-four hours, Ormat will be required to forgo such tests during the prescribed periods.

Finalization of construction and maintenance activities for well placement, pipelines, etc. are required for development of power plant and appurtenant facilities. Implementation of the above mitigation may delay full or timely facility development.

See Section C.2.1 for an analysis of the impacts of the proposed noise mitigation.

C.1.4 MITIGATION OF DIRECT AND INDIRECT EFFECTS TO NESTING SAGE-GROUSE FROM THE GEOTHERMAL PROJECT

Key Issues for Sage-Grouse

In addition to direct effects, Project impacts to nesting sage-grouse are expected from indirect effects such as noise, human activity, and habitat fragmentation. The greatest impacts to nesting sage-grouse are expected during Project construction due to nest abandonment.

Mitigation Measures

During the period from March 15 to June 30, nest "clearance" surveys will be conducted prior to any proposed surface-disturbing activities. The area to be disturbed and a 0.5-mile radius buffer will be surveyed by BLM/USFS-approved specialists to determine if nesting sage-grouse are present. If an active nest is located, a 0.5-mile radius buffer will be placed around the nest and no surface-disturbing activities will occur until the nest is vacated.

Monitoring and Trigger Points

For all aspects of the monitoring plan for sage-grouse impacts, refer to Section C.2. This mitigation is required; there are no trigger points.

Effectiveness of the Proposed Mitigation

These measures will decrease the chance of nest destruction or abandonment due to construction and surface-disturbing activities.

Mitigation Impacts

By avoiding any occupied nest during construction, the likelihood of nest success would be increased, thus ensuring propagation of the local sage-grouse populations.

Should Ormat pursue construction or other surface-disturbing activities during nesting periods, and a nest is found within the construction zone or within the 0.5 mile buffer zone, construction delays for those aspects of the project would occur.

C.1.5 MITIGATION OF INDIRECT EFFECTS OF THE PROJECT TO SAGE-GROUSE BROOD-REARING HABITAT

Key Issues for Sage-Grouse

Several springs, seeps, wet meadow, and riparian areas occur in close proximity to components of the Project. Although it is unknown to what extent these areas are being utilized by sage-grouse, any use by sage-grouse would likely be reduced or discontinued during and after Project development. The project is anticipated to impact 34 acres of brood-rearing habitat.

Mitigation Measures

Ormat will complete treatments at a 4:1 ratio (NGSCT 2010) to protect, enhance and/or restore brood-rearing habitat in targeted locations (Figure 1) on BLM- or USFS-managed land near the Project; this equates to 136 acres (4 x 34 acres). The specific areas to be treated will be identified on a case-by-case basis, determined by field inventory of habitats, conditions, and potential value to sage-grouse. Treatments will be prescribed for specific sites based on the probability of successful restoration/enhancement and the greatest benefit to local sage-grouse metapopulations. The design for these projects will allow access to water for beneficial use through the use of water gaps. Placement and construction of exclosures will also need general concurrence from the appropriate permittee/s. Ormat will fund all such restoration/enhancement/protection projects to BLM or USFS specifications.

- **Treatments may include fencing of riparian areas and meadows for protection, plantings or seedings of desired native riparian species to increase biodiversity and habitat condition, stream restoration to improve riparian areas where there are currently incised channels or nick points, and treatment of invasive and noxious weeds (e.g., salt cedar). Stream restoration may include check dams, rip/rap fortification of damaged banks and nicks, and large boulder placement within stream channels to decrease water velocity during peak flows.**
- **Riparian exclosures may be grazed if the BLM or USFS determine that it would be beneficial to riparian health. Specifics of this grazing will be based on a return to a healthy riparian condition based on current sage-grouse guidelines and working with the local grazing permittee/s.**

Monitoring and Trigger Points

For all aspects of the monitoring plan for sage-grouse impacts, refer to Section C.2. This mitigation is required; there are no trigger points.

Effectiveness of Proposed Mitigation

These treatments will improve sage-grouse brood-rearing habitat to substitute and offset the habitat lost through Project development (IM 2008-204). Riparian areas and meadows are important habitat for sage-grouse brood-rearing. Having healthy riparian areas and meadows that support the native forb species and invertebrate fauna is imperative (Sveum et al. 1998). Excluding riparian areas and meadows from grazing until deemed beneficial, protects the health of those areas. Managed grazing within these exclosures may increase species diversity with desired native species valuable to brood rearing habitat.

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

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

Mitigation Impacts

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

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

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

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

C.1.6 MITIGATION OF INDIRECT EFFECTS ASSOCIATED WITH THE VISUAL PRESENCE OF PROJECT COMPONENTS

Key Issues for Sage-Grouse

Indirect effects to sage-grouse may occur during all seasons resulting from human activity and visual disturbances associated with the geothermal components of the Project.

Mitigation Measures

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

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

Monitoring and Trigger Points

For all aspects of the monitoring plan for sage-grouse impacts, refer to Section C.2. This mitigation is required; there are no trigger points.

Effectiveness of the Proposed Mitigation

Reduced disturbance from visual and human activities will minimize effects to sage-grouse that could otherwise increase shifts of individuals or groups of sage-grouse away from the immediate Project area.

Mitigation Impacts

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

Reduced ambient light emanating from the construction sites and operational facilities of the Project would create less visual disturbance to sage-grouse and other wildlife.

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

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

C.2 MONITORING OF MITIGATION MEASURE EFFECTIVENESS

All mitigation measures outlined above are effective for the life of the Project unless subsequent monitoring deems them inadequate and modification is necessary. Subsequent monitoring will include sound pressure level monitoring (see below), sage-grouse population monitoring (see below), and common raven population monitoring (Appendix D). Because time lags in sage-grouse response to development have been documented (Walker et al. 2007, Harju et al. 2010), all monitoring will be conducted for a minimum of 10 years, commencing with construction of permitted activities.

C.2.1 SOUND PRESSURE LEVEL MONITORING WITHIN THE PROJECT AREA AND 2-MILE BUFFER

The main goal for sound pressure level monitoring is to ensure sound pressure levels are below 49 dBA (MTSGWG 2005, NDGFD 2005, WYSGWG 2006). By recording daily sound pressure levels and monitoring sage-grouse activity at lek locations, a determination can be made as to the adequacy of the 49 dBA level to protect sage-grouse leks (see Sage-grouse Population Monitoring below). During the lekking season (15 March –15 May), when leks are active (one hour before sunrise –10:00 AM), continuous sound pressure level monitoring will be conducted at the four leks closest to the Project using appropriate acoustic monitoring equipment. To determine seasonal lek locations, at least one lek survey would be completed prior to placement of monitoring equipment. Acoustic monitoring equipment will be placed at the lek edge closest to the Project during the afternoon (12:00 –16:00) to avoid disruption to lek activity. During the lekking season, Ormat is required to monitor sound pressure levels daily and report any levels of 49 dBA and above to the BLM immediately. Weekly reports of monitoring will also be filed with the BLM.

Mitigation Measures

Future mitigation measures to reach appropriate sound pressure levels include the following:

- **Modifying operations to reduce the use of cooling fans, pumps, or other noise-producing Project equipment during lekking hours (one hour before sunrise–10:00 AM) during the lekking season (15 March – 15 May);**
- **Employment of an acoustic engineer to identify and assess options to further reduce noise from Project components;**
- **Installation of sound damping shelters, walls, enclosures, or other barriers for pumps or other noise-producing equipment to reduce noise emitting from geothermal facilities (e.g., power plant, wellheads, etc.);**
- **Reducing the amount or changing the timing of project related vehicular traffic;**
- **Installing poly-slats on chain link fences or other barriers around geothermal facilities to further attenuate noise emitted from those facilities.**

Trigger Point

Threshold:

If through daily monitoring, sound pressure levels are documented that exceed 49 dBA at any lek, Ormat must implement additional mitigation measures to reduce sound pressure levels below 49 dBA immediately. Sound pressure level monitoring data documenting successful reduction in dBA levels must be demonstrated and reported to the BLM within one week of the occurrence.

Effectiveness of Proposed Mitigation

By reducing noise disturbances associated with the Project during the lekking season at the time of day lekking occurs, disturbance to a lek will be reduced. The diminished disturbance to the lek will reduce the chance of lowered male lek attendance, shifting of lek locations, or loss of active lek locations due to sound disturbance.

Mitigation Impacts

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

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

C.2.2 SAGE-GROUSE POPULATION MONITORING WITHIN THE PROJECT AREA AND 2-MILE BUFFER

Annual monitoring of sage-grouse leks will be required. This includes both active leks and leks with unknown status, until those leks with unknown status are determined to be inactive. Conversely, if any unknown status leks are determined to be active, the active leks mitigation would apply. Data sheets or copies of these data sheets will be provided weekly to the BLM, NDOW and USFS. Lek surveys must be completed by BLM/USFS-approved biologist/s following standard lek survey protocol (Attachment 1) and ensure the following:

- Surveys must be conducted between 15 March and 15 May of each year. Male lek attendance is typically greatest later in the season; thus adjustments to lek survey schedules may be needed to collect accurate data.

- Surveys must be conducted at least four times per lek during the lekking season with eight days between lek visits.
- A center point of the lek activity will be recorded during each monitoring visit to document any shift in the lek location over time. The center point location will be recorded with a GPS unit either after lek activity has dispersed or by projecting the location using a rangefinder and compass bearing.
- Surveys must be conducted from one-half (1/2) hour before sunrise until 10:00 AM each survey period.
- Utilizing current roads, transects will need to be completed within the 2-mile project buffer area to look for new leks. This will also need to be completed within the above seasonal and daily time frames.

To account for and evaluate annual climatic variations that may be influencing male lek attendance, the results from each of the monitored leks should be compared to the closest NDOW trend leks outside the Project influence.

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

Threshold:

If population monitoring detects any of the following conditions and they are determined to be a result of the Project, Ormat must take measures to mitigate these impacts.

- >50% decrease in the average three-year lek attendance compared to the long-term average.
- >50% decrease in male lek attendance in two consecutive years of monitoring.

MITIGATION

Mitigation measures to eliminate decreased male lek attendance:

- **Reduction in sound pressure level to <u>40 dBA</u> (Crompton 2005) at sage-grouse leks must be demonstrated during the next lekking season. This may be accomplished by adjusting to stricter levels of the previously identified measures:**

- **Modifying operations to reduce the use of cooling fans, pumps, or other noise-producing Project equipment during lekking hours (one hour before sunrise– 10:00 AM), during the lekking season (15 March –15 May);**
- **Employment of an acoustic engineer to identify and assess options to further reduce noise from Project components;**
- **Installation of sound damping shelters, walls, enclosures, or other barriers for pumps or other noise-producing equipment to reduce noise emitting from geothermal facilities (e.g., power plant, wellheads, etc.);**
- **Reducing or changing the timing of vehicular traffic;**
- **Installing poly-slats on chain link fences or other barriers around geothermal facilities to further attenuate noise emitted from those facilities.**

Effectiveness of Proposed Mitigation

Reducing noise disturbances associated with the Project during the lekking season at the time of day lekking occurs will reduce the disturbance to a lek. The diminished disturbance to the lek will likely lessen the chance of lower male lek attendance.

Mitigation Impacts

Refer back to C.2.1 “Mitigation Impacts” for a discussion of the above mitigation impacts.

C.3 REPORTING

An annual report documenting results from sound pressure level monitoring and sage-grouse lek and nest monitoring will be submitted to the BLM, USFS and NDOW no later than August 31 each year. Reports should include the following:

- Sound pressure level monitoring results, including daily dBA levels during the outlined lekking season and times; location (UTM, NAD83) of acoustic monitoring equipment; any isolated incidents that may have increased dBA levels temporarily
- Sage-grouse lek monitoring, including lek count data sheets, center point of sage-grouse leks (UTM, NAD83), isolated incidents disturbing sage-grouse lekking activities
- Sage-grouse radiotelemetry results
- Sage-grouse nest sites (UTM, NAD83) found during “clearance” surveys or collected opportunistically through other monitoring activities.
- If future mitigation measures are implemented, identification and a detailed description of the mitigation measure and date of implementation will also be reported.
- An annual meeting, to be held in the winter months, with Ormat, contractors, BLM, USFS, USFWS and NDOW. This meeting will involve a presentation and discussion of the previous year’s monitoring data and further discussions regarding activities and requirements for the coming year.

Attachment 1

Greater Sage-Grouse Lek Count Protocol

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

1) Arrive at the lek at least 45 minutes before sunrise.
2) Do not approach any closer than about 200 meters from the lek. This will prevent disturbance of the birds while strutting.
3) Conduct all counts between 30 minutes before sunrise and 1.5 hours after sunrise.
4) If at all possible, observe the lek from inside your vehicle. Sage-grouse are less sensitive to the approach of a vehicle and its presence than they are to you.
5) Note your arrival time and departure time on the lek count form.
6) Obtain a minimum of three counts at 15-minute intervals of each lek on each date counted. A count of males, females, and unknown birds is always preferable to a flush count.
7) In the comments section of the form, please note the following information:
    a. Wind direction and speed
    b. Temperature in degrees Fahrenheit
    c. Ground condition – dry, muddy, snow (depth in inches)
    d. Cloud cover in the following manner:
        i. Clear
        ii. Partly cloudy (less than 25% cover)
        iii. Scattered (more than 25% but scattered horizon to horizon)
        iv. Cloudy (more than 50% cover)
        v. Foggy
8) Note the presence of predators by species, time and activity: Example – golden eagle @ 6:45 a.m. flying over lek; coyote chasing grouse at 8:15 a.m.
9) Be sure to use the common name of the lek.

NEVADA DEPARTMENT OF WILDLIFE

LEK COUNT DATA COLLECTION FORM

LEK ATTRIBUTES

LEK ID: _____ LEK NAME: _____

LEK COMPLEX: _____ TREND LEK: _____

PMU NAME: _____ PLANNING UNIT: _____

NDOW REGION: _____ UNIT: _____ BLM DISTRICT: _____

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

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

SURVEY ATTRIBUTES

OBSERVER NAME(S): _____ SURVEY METHOD: _____

TIME OF ARRIVAL: _____ SUNRISE: _____

DATE OF SURVEY: _____ TIME OF SURVEY: _____

WEATHER CONDITIONS: _____

_____

TEMPERATURE: _____

WIND SPEED: _____ DIRECTION: _____

OTHER ANIMALS AT LEK: _____

_____

LEK COUNT DATA

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

HIGH COUNT MALES: _____ FEMALES: _____ UNKNOWN: _____

REMARKS:

Form Revised: March 4, 2008

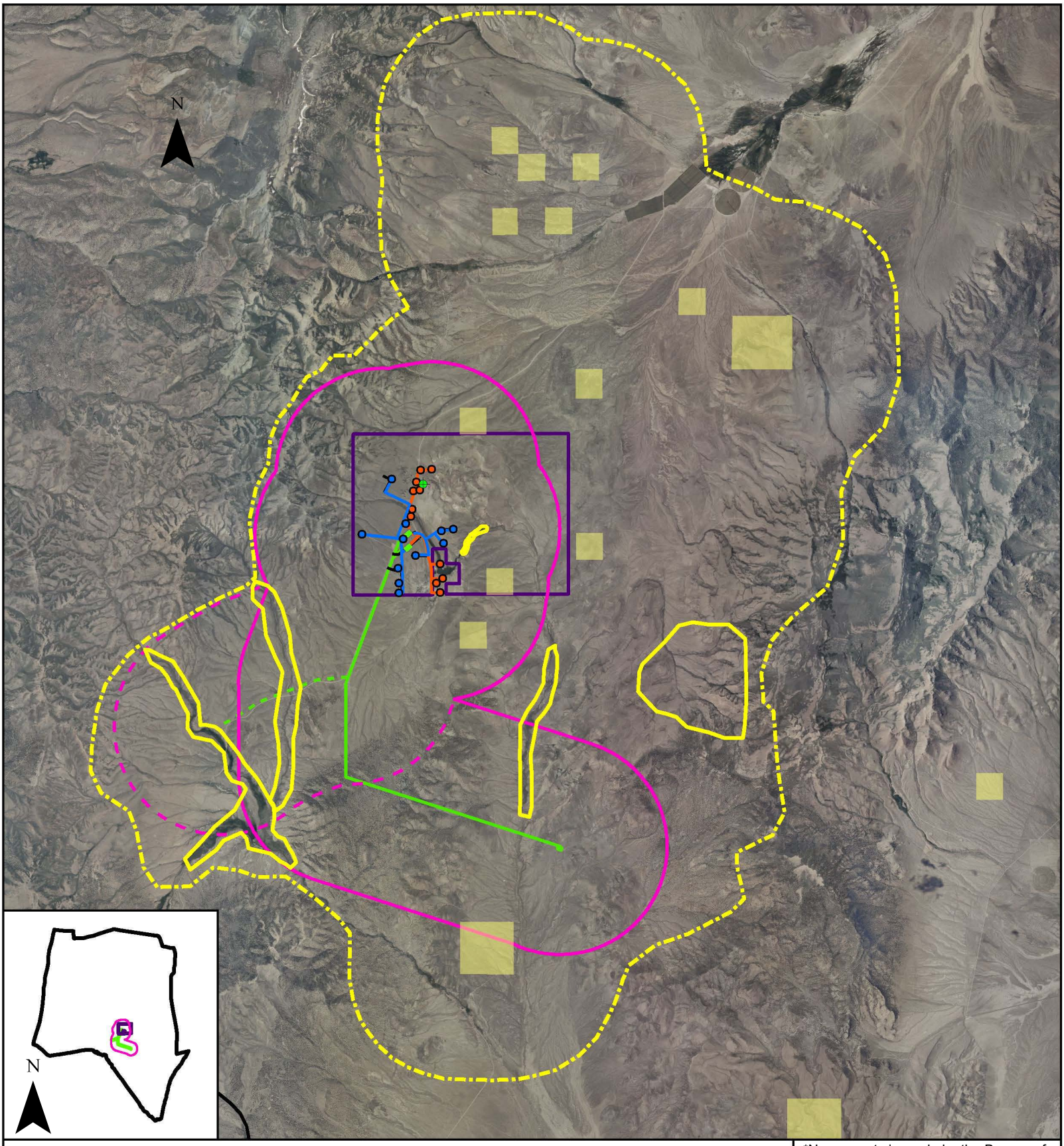

Figure 1: Sites for 4:1 mitigation for impacts to water resources (34*4 = 136 acres), and area for 4:1 mitigation for impacts to sage-grouse habitat (217*4 = 868 acres).

- Habitat Restoration Mitigation Area
- Water Resource Mitigation Site
- Active Lek Area
- Toiyabe PMU
- Proposed Project 2-mile Buffer
- Alternative Project 2-mile Buffer
- Geothermal Unit Area
- Monitoring Well
- Proposed Injection Pipeline and Wells
- Proposed Production Pipeline and Wells
- Proposed Access Road
- Power Plant
- Proposed Power Line
- Alternative Power Line

1:150,674

NATIONAL SYSTEM OF PUBLIC LANDS

0 0.5 1 2 Miles

*No warranty is made by the Bureau of Land Management as to the accuracy, reliability or completeness of these data for individual use or aggregate use with other data.

The data shown on the map uses the Universal Transmercator (Zone 11N) Coordinate system and uses the NAD83 projection. Map date: 03/25/2011.

United States Department of the Interior
Bureau of Land Management
Mount Lewis Field Office
50 Bastian Road
Battle Mountain, NV 89820

Appendix D: Common Raven Monitoring Plan

APPENDIX D

Common Raven Monitoring, Mitigation, and Management Plan
for
McGinness Hills Geothermal Project

Greater sage-grouse (*Centrocercus urophasianus*) use of the Project area has been documented through field surveys (GBE 2010, Nevada Department of Wildlife [NDOW] 2011), observational records (Nevada Natural Heritage Program XX), and telemetry data collection (NDOW 2011). One identified source of risk to sage-grouse from Project development is increased occurrence of common ravens (*Corvus corax*; hereafter raven) utilizing the Project vicinity. Research indicates that increased raven numbers are common near anthropogenic structures (Knight and Yawashima 1993, Webb et al. 2004). Such an increase is expected with the McGinness Hills Geothermal Project development and would likely have detrimental impacts to greater sage-grouse (Coates and Delehanty 2008, Bui et al. 2010).

By implementing monitoring, mitigation, and control measures, impacts to greater sage-grouse from increased occurrence of common ravens will be minimized.

SOURCES OF CONCERN AND MANAGEMENT PRACTICES

Several features associated with development have the potential to attract common ravens to the Project area. The primary focus of management practices will be to reduce human-provided subsidies, including food and perching/roosting/nesting sites.

Ravens are considered scavengers and will opportunistically utilize waste produced at anthropogenic sites as food resources (Webb et al. 2004, Coates et al. 2007). The following procedures will be implemented by the Operator to reduce raven food attractants near the Project.

Immediate Mitigation Measures:

- **During all phases of the Project (i.e., construction and operations), all food, waste, and trash will be placed in closed containers.**
- **Ormat will prohibit employees, contractors and sub-contractors from feeding wildlife or leaving food available for scavenging wildlife.**
- **Road-killed animals on the Project site and associated travel routes will be promptly removed and disposed of in closed containers to eliminate access to ravens.**
- **Presence of road-killed animals will also be minimized by the Operator's environmental protection measure of a maximum 25 mph speed limit within the Project area.**

- **Ormat has committed to implement the following environmental protection measures: perch and nest deterrents on all power poles; single-pole transmission line design (APLIC 2006).**
- **Ormat will acquire common raven depredation permits from the NDOW or USFWS.**

Effectiveness for Proposed Mitigation

By implementing these mitigation measures, food subsidies produced by humans will be reduced, which will likely minimize raven presence near the Project. New perching, roosting, and nesting sites would primarily occur along the 9.01 miles of transmission line and power poles. The Operator has already minimized these effects through their proposed environmental protection measures. These include utilizing a single pole design along the entirety of the transmission line, which will decrease potential perching, roosting, and nesting sites for ravens. In addition, the Operator will install a cone (Kaddas Enterprises type KE1140 or equal) on each power pole to deter raven perching, roosting, and nesting sites.

Additional perching, roosting, and nesting sites may also occur on well pads and production plant sites. These sites include wellheads, fencing, building roofs, and other structures. Monitoring of raven occurrence at these sites will identify the extent to which structures are being utilized (see Monitoring Plan). Additional mitigation measures may be required if increases or concentrated raven numbers are identified (see Monitoring Plan).

Mitigation Impacts

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

Acquiring depredation permits will add to Ormat's ability to maintain lower numbers of ravens. In turn, this reduction will lower potential predation on sage-grouse by ravens.

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

Application of the 2006 APLIC standards should limit perching opportunities of raptors and common ravens on sage-grouse. Application of APLIC standards to transmission line facilities will be an additional financial burden to Ormat through the purchase and use of anti-perching devices and changes in engineering design of conductors to limit potential electrocution of most avian species.

Monitoring and Trigger Points

A common raven monitoring plan will be implemented to assess changes in raven numbers and identify areas of increased raven use due to Project development and human activities associated with the Project.

- Resumés and experience of potential biological monitors will be submitted to and approved by the BLM before monitoring begins.
- During construction and year one and two of operations, weekly monitoring for raven nests will be completed from 01 March – 31 July at the production plants, well pads, and along the transmission line.
- Basic information that will be recorded for each monitoring session will include: 1) date and time of day, 2) observer, 3) location (NAD 83 UTM), 4) activity (i.e., perching/nesting, flying, ground, 5) any other avian mortalities associated with the transmission line (e.g., raptors, sage-grouse); if ravens are located perching or nesting, note what structure is being utilized)
- During weekly monitoring, all unoccupied nests and nesting material will be removed from Project structures as located. If eggs are present in nests, a location and description (as described above) will be recorded, but the nest will be left intact until further mitigation is deemed necessary (see Future Mitigation Measures).
- A monthly report summarizing findings will be submitted to the BLM, United States Fish and Wildlife Service (USFWS), and NDOW.

Through this monitoring plan, the Operator will coordinate with the BLM, USFWS, and NDOW to determine the effectiveness and adequacy of initial mitigation measures as determined by raven trends documented in monthly reports. If initial mitigation measures are deemed adequate over the 3-year period, monitoring frequency may be reduced or eliminated as agreed upon by the BLM, USFWS, and NDOW. If initial mitigation measures are deemed inadequate because sustained increases in raven occurrences are documented during the raven and sage-grouse breeding seasons, or if a trend in raptor and sage-grouse mortalities is detected in associated with the transmission line, the following measures may also need to be implemented:

Additional Mitigation Measures:

- **Additional perch deterrents on Project structures will be required if monitoring identifies areas where raven perching, roosting, or nesting is concentrated or regularly occurring. Specific details on type of deterrent to be used will be determined and coordinated by the BLM, USFWS, and NDOW based on the Project structure.**
- **Hazing using auditory and visual deterrents may be useful in areas of concentrated raven presence are identified. Methods may include visual deterrents, such as streamers or flagging, and auditory deterrents, such as gas cannons. A variety of**

methods would need to be implemented and frequently changed to increase efficacy of deterrents.

- **Lethal measures to reduce raven numbers in the Project area may also be needed to reduce raven presence around the Project. This would require the Operator to acquire a common raven depredation permit through United States Department of Wildlife Services (WS) and USFWS. Primary depredation activities would focus on removal of active raven nests (those with eggs or chicks) and raven management using chicken egg baits treated with CPTH (3-chloro-p-toluidine hydrochloride) or another approved compound. Details regarding this depredation permit would be finalized during the permitting process by WS and USFWS.**
- **Retroactive installation of flight diverters along the transmission line to reduce the likelihood of avian collisions.**

Effectiveness of Mitigation

By implementing a suite of immediate mitigation measures and, as identified through monitoring, future mitigation measures, raven presence around the Project area should be reduced and minimized, which subsequently will reduce raven impacts to sage-grouse utilizing the habitat.

Mitigation Impacts

The measures described above will lead to additional costs to Ormat. These costs will be accrued mostly through equipment and labor.

Increasing the number deterrents (visual, auditory and perch) in areas where concentrations of ravens are occurring should alleviate raven predation on sage-grouse in those areas. Some of these measures may have some impact on other wildlife species (visual and auditory) e.g. gas cannons and noise disturbance.

Lethal measures of take for common ravens will directly reduce the raven population; this in turn, will reduce predation on sage-grouse from ravens. Limited indirect impacts may occur on other wildlife species.

The installation of flight diverters along the transmission line will reduce the impacts of avian collisions. The reduction of collisions will reduce the numbers of carcasses which could attract scavenging bird like ravens. By reducing the number of ravens, the number of raven predations on sage-grouse may also reduce.