CHAPTER 2
DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

2.1 INTRODUCTION

SPPC filed an application with the BLM SFO to obtain a ROW across public land. In addition, both Ormat and Vulcan have submitted POUs to develop geothermal resources on public lands. Together, the three proposals are referred to as the Salt Wells Energy Projects (Proposed Actions). As described in Chapter 1, BLM previously approved associated activities for the Vulcan and Ormat projects. These activities are discussed in more detail in **Chapter 5**, Cumulative Impacts.

Alternatives considered in this EIS are based on issues identified by BLM and cooperating agencies, as well as comments received during the public scoping process. Alternatives are intended to reduce or minimize potential impacts associated with the Proposed Actions, while still meeting the purpose of and need for the Proposed Actions.

2.2 PROPOSED ACTIONS

Sierra Pacific Power Company Proposed Action – Fallon 230-kV Source Project

SPPC proposes to build two switching stations, one 230-kV transmission line, two 60-kV electric line folds, and one substation, as follows:

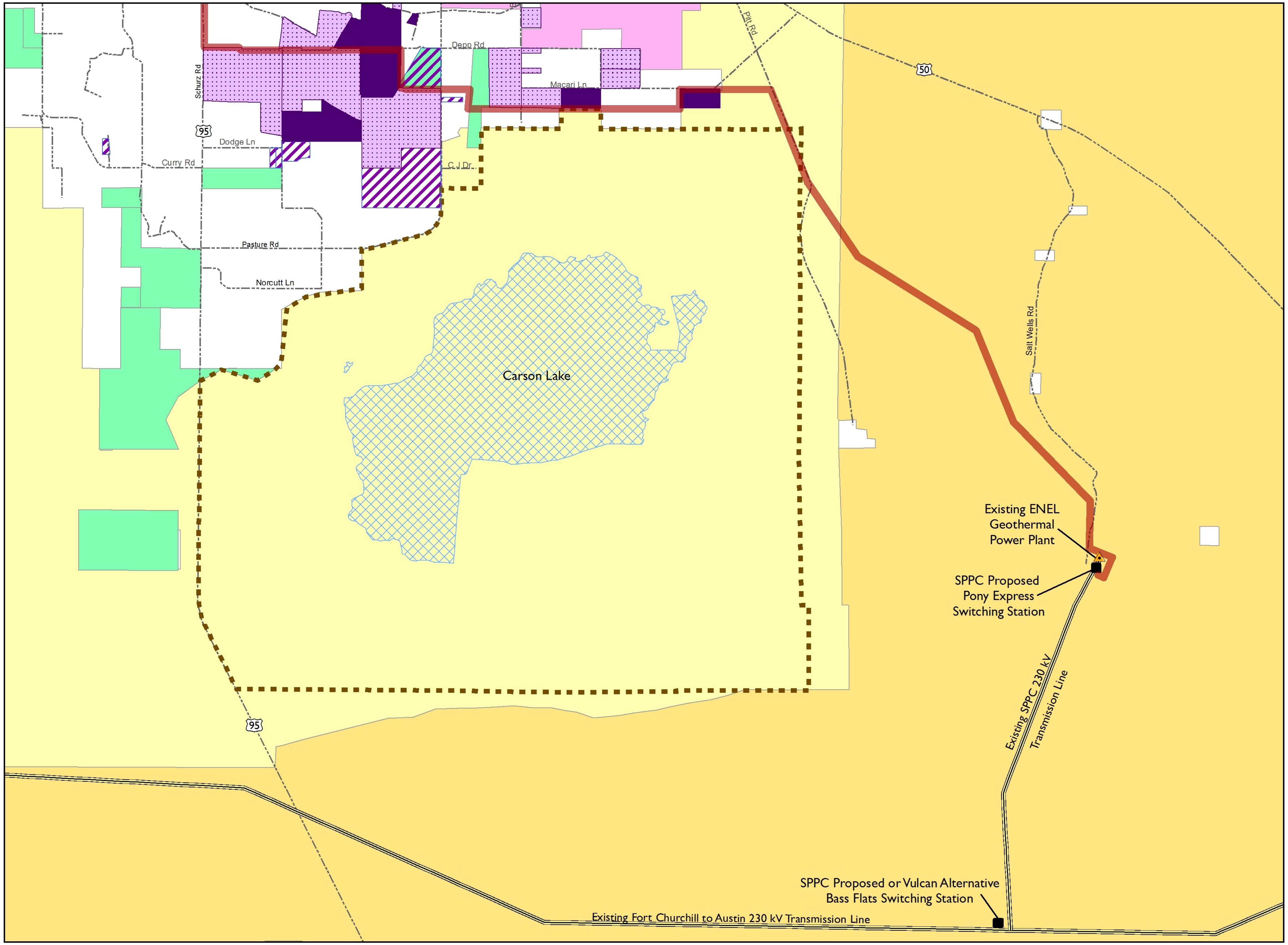
- Construction of a new Bass Flat Switching Station at the junction of the existing Fort Churchill to Austin 230-kV transmission line and the ENEL 230-kV transmission line;
- Construction of a new Pony Express Switching Station adjacent to the existing ENEL Geothermal Power Plant;
- Construction of a new Greenwave Substation;
- Construction of a 230-kV transmission line from the proposed Pony Express Switching Station to the Greenwave Substation; and
- Installation of two 60-kV electric line folds on four single-pole structures connecting the proposed Greenwave Substation to the

existing 60-kV transmission lines which are connected to the existing Fallon Substation north of Sheckler Road.

The major components of SPPC's Fallon 230-kV Source Project are described in **Table 2-1**, Proposed Fallon 230-kV Source Project Facilities, and depicted on **Figure 2-1**, Sierra Pacific Power Company's Fallon 230-kV Source Project Proposed Action–South, and **Figure 2-2**, Sierra Pacific Power Company's Fallon 230-kV Source Project Proposed Action–North. Figures 2-1 and 2-2 also show the land ownership status for all lands within the project area. SPPC would implement the BMPs, as defined by the NDEP (2008), which include accepted measures identified in in the POD and outlined in **Appendix E**, Environmental Protection Measures and Best Management Practices, during construction and operation of the project.

Table 2-1
Proposed Fallon 230-kV Source Project Facilities

Project Component	Location/Description	Temporary Disturbance	Permanent Disturbance
Proposed Bass Flat Switching Station	Approximately 20 miles southeast of Fallon.	500 x 500 feet (+/- 5.75 acres)	500 x 500 feet (+/- 5.75 acres)
Proposed Pony Express Switching Station	On public land adjacent to ENEL's Salt Wells Geothermal Power Plant (approximately 16 miles southeast of Fallon, Nevada).	500 x 500 feet (+/- 5.75 acres)	500 x 500 feet (+/- 5.75 acres)
Proposed Greenwave Substation	South side of Sheckler Road in Fallon, Nevada.	11.5 acres	11.5 acres
Proposed 230-kV Transmission Line	Between the Proposed Greenwave Substation and the Proposed Pony Express Switching Station.	Length: 21.7 miles Width: 300-foot ROW Total Disturbance: 789 acres	Length: 21.7 miles Width: 125-foot ROW for H-frame pole and 60-foot ROW for single pole. Total Disturbance (assuming all H-frame pole buildout): 329 acres
Proposed 60-kV Electric Line Folds	Installation of two 60-kV electric line folds on four single-pole structures from the proposed Greenwave Substation to the existing 60-kV transmission lines across the street.	Length: 250 feet Width: 100-foot ROW Total Disturbance: 0.6 acres	Length: 250 feet Width: 100-foot ROW Total Disturbance: 0.6 acres
Total Estimated Disturbance:		**813 acres**	**352 acres**



Sierra Pacific Power Company Proposed Action, South

Churchill County, Nevada

SPPC Facilities

- Proposed 230 kV Transmission Line Corridor

Other Features

- Proposed Switching Station
- Existing Power Plant
- Existing 230kV Transmission Line
- CLP Title Transfer
- Existing Conservation Easement
- Approved, Pending Conservation Easement
- Proposed Conservation Easement
- Open Water

Land Ownership

- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Fish and Wildlife Service
- Private Land (Including city and county lands)

Souce: BLM 2010, Churchill County 2010, SPPC 2010, USFWS 2011, US Navy 2011a, US Navy 2011b

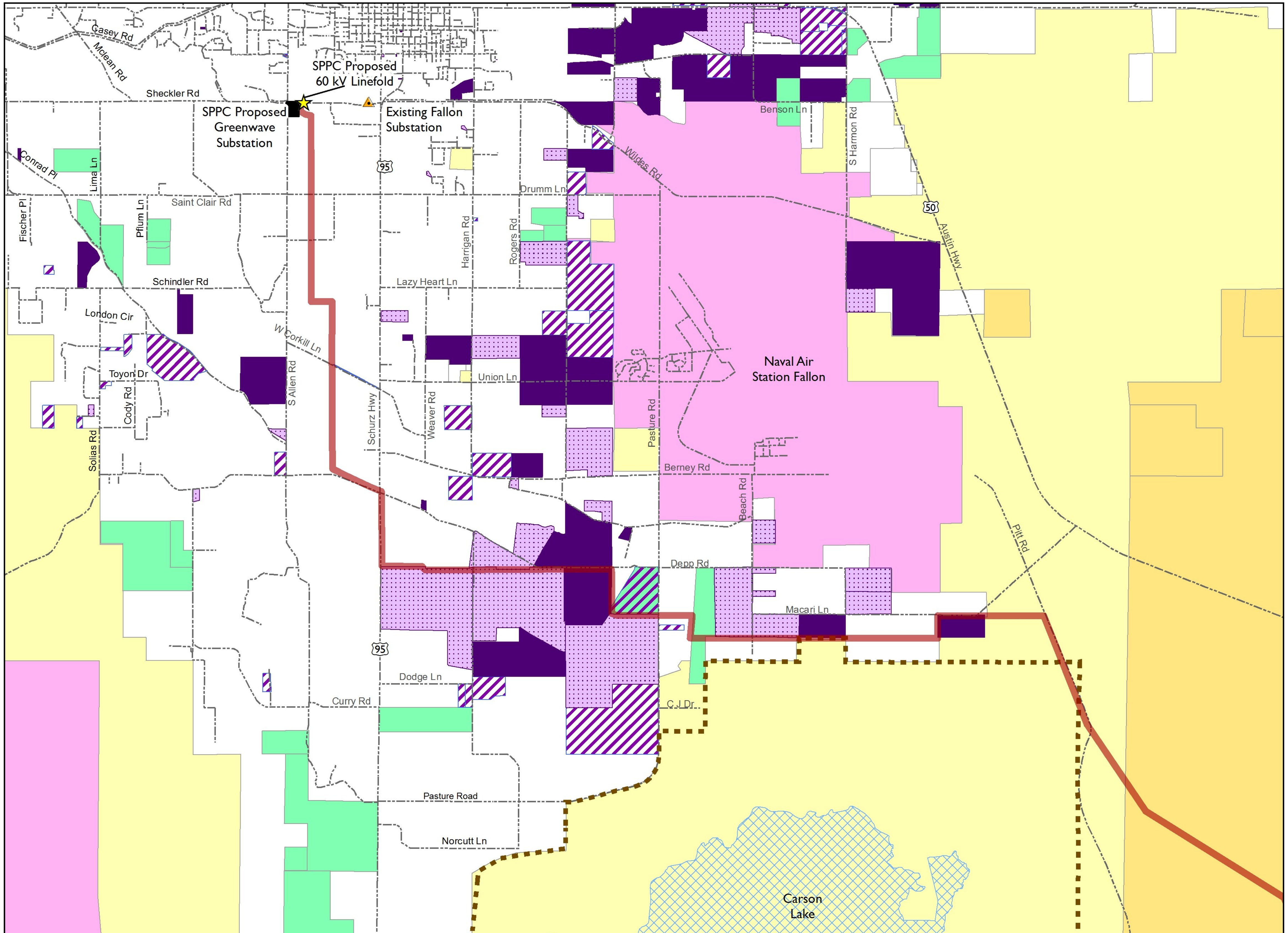
0 0.75 1.5
Miles

N

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-1

This page intentionally left blank.



Sierra Pacific Power Company Proposed Action, North

Churchill County, Nevada

SPPC Facilities

- Proposed 230 kV Transmission Line Corridor
- Proposed 60 kV Linefold

Other Features

- Proposed Substation
- Existing Substation
- CLP Title Transfer
- Existing Conservation Easement
- Approved, Pending Conservation Easement
- Proposed Conservation Easement
- Open Water

Land Ownership

- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Fish and Wildlife Service
- Private Land (Including city and county lands)

Source: BLM 2010, Churchill County 2010, SPPC 2010, USFWS 2011, US Navy 2011a, US Navy 2011b

0 0.5 1
Miles

N

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-2

This page intentionally left blank.

Proposed Bass Flat Switching Station

The purpose of a switching station is to tie three or more transmission lines together at a single point, and separate and protect each line segment with circuit breakers. Like a substation, a switching station would contain switches, circuit breakers, electrical bus work, and a control building. It does not however have a transformer. All of the lines entering and exiting a switching station are at the same voltage.

The Bass Flat Switching Station would involve the construction of an expandable 5-breaker, breaker and a half switching station on an approximate 5.75-acre parcel. The site would be immediately northwest of the line tap point where the existing 230-kV transmission line from the ENEL Geothermal Power Plant ties into the existing 230-kV transmission line between Fort Churchill and Austin. The existing line tap configuration is not adequate to serve the Fallon area or the new power plants proposed by Vulcan or Ormat. The new switching station would provide circuit breakers and remote switching capabilities (via a microwave and fiber optic system discussed under Communications) that would allow safe and reliable operation of the transmission tie to ENEL, Vulcan, Ormat, and Fallon, as well as the existing 230-kV system between Fort Churchill and the eastern parts of Nevada. The Bass Flat Switching Station would have a 110-foot microwave tower to allow for communication to the SPPC Microwave site at Eagle Ridge. SPPC would use existing roads for access during construction, operations, and maintenance. Any road improvements (blading, adding gravel, etc.) or additional disturbances not currently anticipated would be discussed in the revised POD as identified and discussed under the Construction subsection of the proposed 230-kV transmission line.

Work at the switching station site would begin by clearing existing vegetation and organic matter from the site. The site would then be graded to a level pad (approximately 5 to 6 acres) for installation of the equipment. Once the pad is prepared, the site would be secured with chain-link fencing. Structure footings and underground utilities, including an electrical conduit and additions to the grounding grid, would be installed followed by aboveground equipment. Once the equipment is installed, the site would be graded and medium gray gravel, two inches wide or less, would be spread over the site to a depth of approximately four inches. Temporarily disturbed areas surrounding the switching station would be revegetated.

Proposed Pony Express Switching Station

The Pony Express Switching Station would be located adjacent to ENEL's Salt Wells Geothermal Power Plant on an approximate 5.75-acre parcel. The switching station would allow the existing 230-kV transmission line to the geothermal plant to be re-terminated and the proposed 230-kV transmission line to continue northwest to the proposed Greenwave Substation in Fallon. Construction methods would be the same as those identified under the proposed Bass Flat Switching Station. SPPC would use existing roads for access.

Any additional disturbance for access would be discussed in the POD.

Proposed Greenwave Substation

The proposed Greenwave Substation would involve the construction of a substation within an 11.5-acre area using the same methods as identified in the description of the proposed Bass Flat Switching Station. The purpose of a substation is to convert energy from the high voltage transmission lines to lower voltage transmission or distribution lines. A substation would contain one or more high voltage line terminals and one or more lower voltage line terminals, separated by a transformer. It would also contain associated high and low voltage electrical equipment, including switches, circuit breakers, electrical bus work, and a control building.

Proposed 230-kV Transmission Line

The proposed 230-kV transmission line would be constructed from the proposed Pony Express Switching Station to the Greenwave Substation. In between these two power facilities, the transmission line may be connected to the Vulcan Bunejug Switching Station and/or the Ormat Macari Switching Station, which are both discussed under the respective proposed projects. From the proposed location of the Macari Switching Station, the proposed 230-kV transmission line route would travel west for approximately one-half mile, south one-half mile and west approximately five miles before jogging north one-half mile and continuing west for approximately two miles. The line would cross Pasture Road and then head north one mile and west between Pasture and Testolin Roads. The route would continue west to Highway 95, turn north and cross west at an angle along Depp Road to mid-way between Highway 95 and Allen Road, and turn north again to the Greenwave Substation.

The proposed 230-kV transmission line would be a single-circuit transmission line consisting of steel or wood H-frame tangent structures, steel or wood three-pole dead-end heavy angle structures, steel single-pole heavy angle dead-end structures, and steel single-pole staggered tangent structures. The total width of the permanent ROW would be 125 feet for H–frame structures and 60 feet for single-pole structures. H–frame structures would be from the Pony Express Switching Station to the Macari Switching Station. H-frame structures are used in open rural areas where longer spans can be achieved and wider ROWs are easy to obtain. Single-pole configuration is used in urban areas where greater ROW restrictions exist and the line routes follow roads, ditches, and property lines. H-frame structures would typically be 60 to 75 feet above ground level, depending on terrain. Single-pole structures would typically be 80 to 85 feet above ground level to allow for vertical stacking of the transmission conductors and additional distribution underbuild circuits. Typical drawings of 230-kV transmission structures are provided as **Figures 2-3** through **2-6**. The 230-kV transmission line would use a 795 MCM aluminum conductor, which is 1.06 inches in diameter. The typical distance between structures would be

Figure 2-3 H-Frame Tangent Structure Typical Drawing

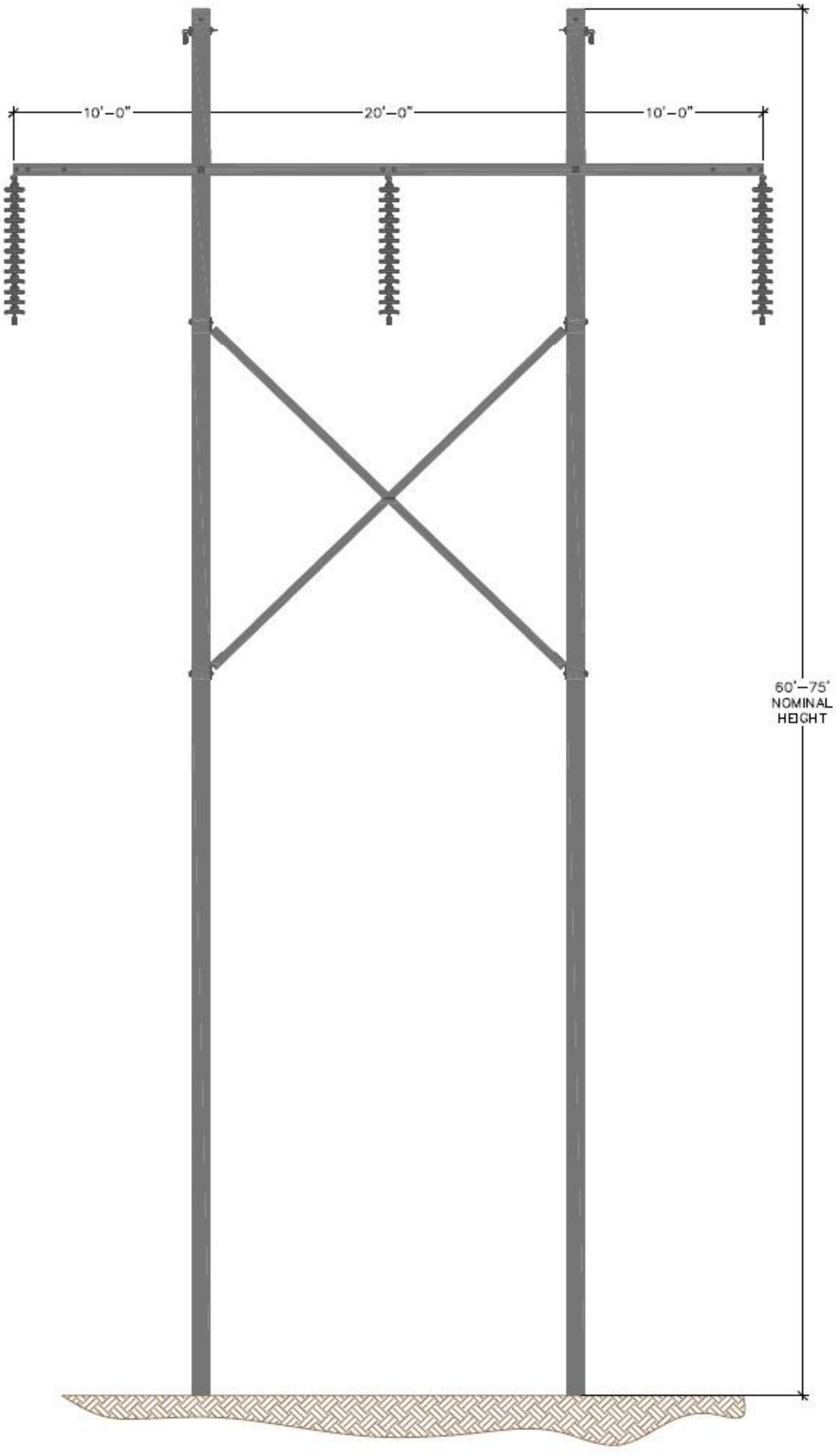


Figure 2-4 Three-Pole Dead-End Heavy Angle Structure Typical Drawing

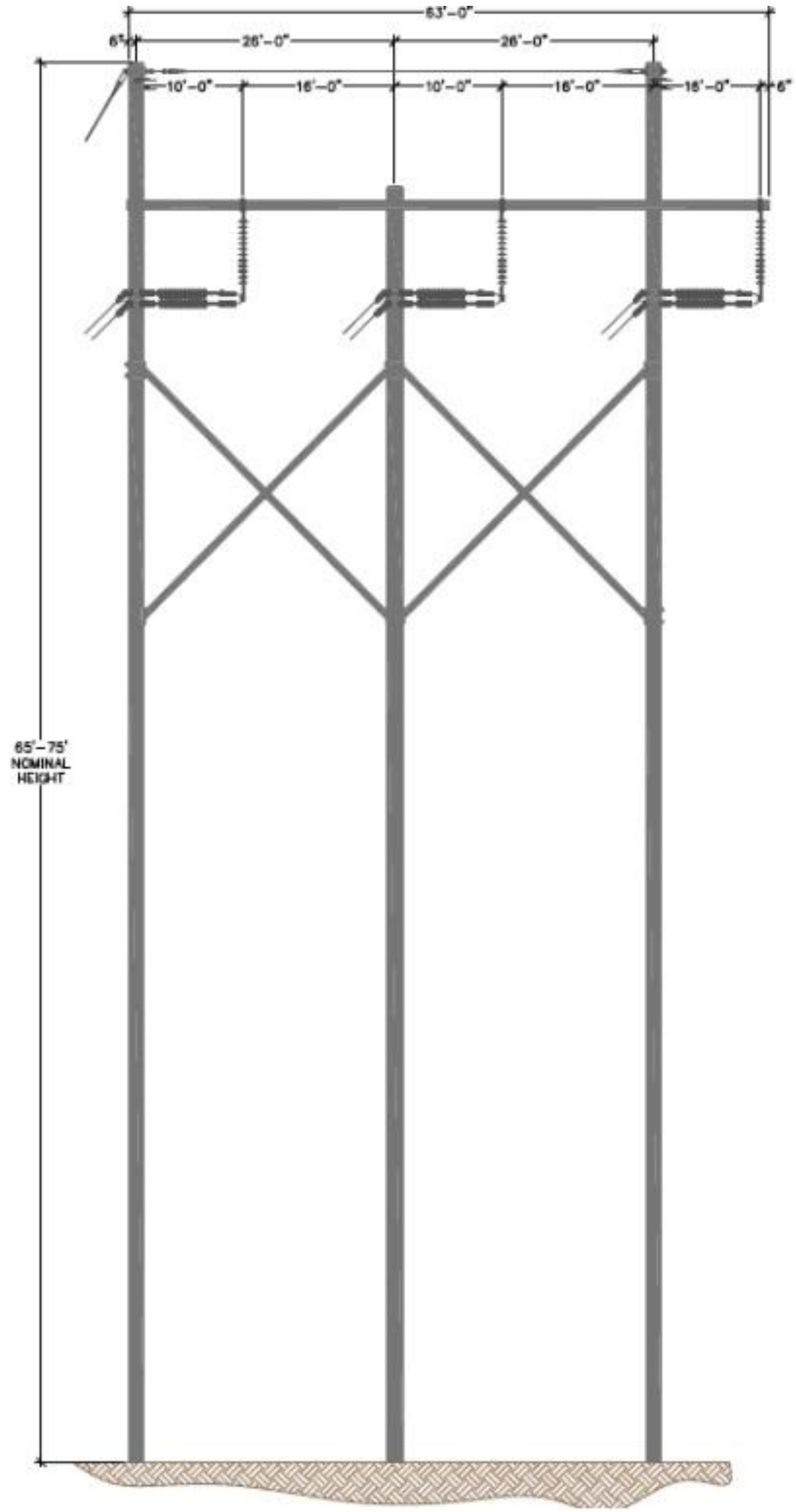


Figure 2-5 Steel Single-Pole Self-Supporting Angle Structure

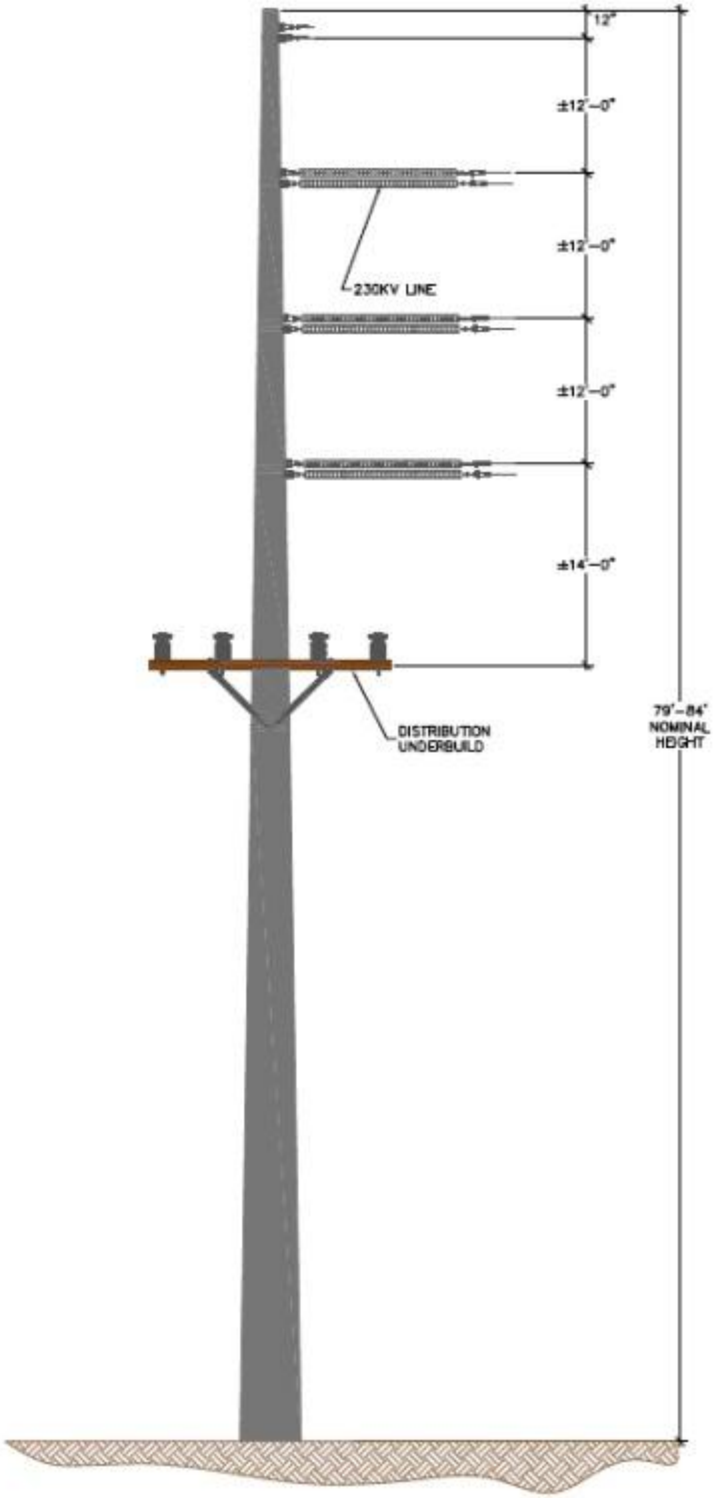
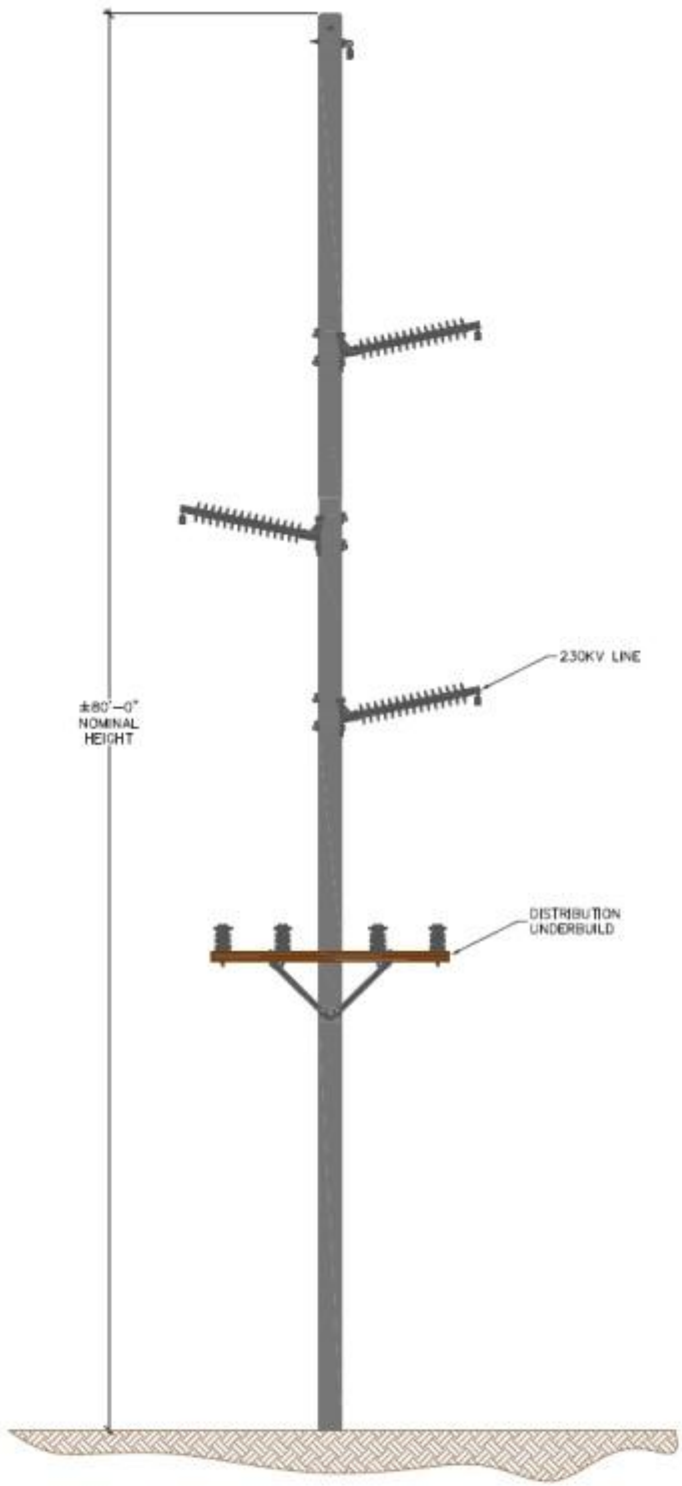


Figure 2-6 Single-Pole Staggered Tangent Structure Typical Drawing



approximately 1,000 feet for two- and three-pole structures and approximately 400 feet for single-pole structures. The minimum ground clearance for the 230-kV transmission line would be 26 feet. Under the Proposed Action, the transmission line would consist of above-ground facilities only, no burying or undergrounding of lines is proposed. The estimated cost to construct an underground 230-kV transmission line is five to six times greater than that to construct overhead facilities. Undergrounding costs are estimated to be 3 to 3.5 million dollars per mile, although the actual costs can vary greatly depending upon the route, street cuts, repaving, field/farm repair, ditch crossings, underground conflicts, construction access, and water table. The estimated construction cost for the overhead, single-pole 230-kV transmission line would be about $600,000 per mile. The additional cost would have to be paid by the utility customers in the rate district, in this case all residents and businesses within Churchill County. Based on an estimated cost per kilowatt hour (kwh) per $1,000,000 invested in undergrounding rather than typical overhead facilities divided by the number of kwh over a three year period (forecast for 2013, 2014, and 2015) for all of Churchill County (416,978,000 kwh), the amount would be approximately $0.00240/kwh. This scenario does not include the carrying costs so the amount would actually be higher. However, under this scenario, if the average residential customer uses 9,000kwh/year then they would pay approximately $21.60 per every $1,000,000 invested in undergrounding.

The proposed 230-kV system improvements were designed to accommodate 135 MW of generation with projections of up to 100 MW of additional generation in the area. If the proposed generation levels are reduced or eliminated, the remaining generation could be connected at 120 kV or even 60 kV into the Fallon area, Studies completed to date have only analyzed the maximum generation levels proposed by the developers. Sensitivity studies to determine the various generation levels relative to the different interconnection voltages have not been completed.

Transmission Line Construction

The construction workforce for the transmission line would consist of approximately 25 to 50 personnel. Project construction would also require additional support personnel contracted by SPPC, including construction inspectors, surveyors, project managers, and environmental inspectors.

In order to accommodate construction activities, SPPC would require a temporary 300-foot-wide ROW for the 230-kV transmission line. To accommodate construction equipment and activities, temporary work pads, which would be approximately 1.5 acres for three-pole angle structures, 0.75 acre for H-frame structures and single-pole angle structures, and 0.30 acre for single-pole staggered tangent structures, would be necessary at each transmission structure site.

The project would be constructed using BMPs and in accordance to all relevant codes (e.g., National Electric Safety Code and Uniform Building Code). Qualified specialists would be employed during the construction to address special site conditions, such as geotechnical engineers to plan and design for slope stability and seismic events.

Prior to construction, a revised POD would be developed and submitted to BLM and Reclamation for approval. The POD would outline the specifics of how the proposed project would be constructed, operated, and maintained and would include monitoring measures to ensure all commitments are fulfilled. SPPC would implement the applicable mitigation measures and BMPs identified in **Appendix E**, Environmental Protection Measures and Best Management Practices, during construction and operation of the project. In addition, several separate plans would be developed to address specific issues, potentially including the following: 1) general spill prevention control, 2) fire, emergency preparedness, and response, 3) blasting, transportation management, flagging, and fencing, 4) weed management, 5) stream, wetland, well, spring, and canal protection, 6) reclamation and habitat restoration, 7) wildlife protection, and 8) soil conservation and erosion/dust control. The POD would also outline the exact access road, staging area, and stringing area locations. Any additional resource studies would be completed and approved by the BLM prior to issuing a short-term ROW for construction purposes and the Notice to Proceed. Implementing appropriate procedures and mitigation measures outlined in this EIS would be included in the POD. The following sections discuss the approximate construction methods to be used for the transmission line project.

Stringing Sites. These sites are necessary to install the conductor for the 230-kV and 60-kV transmission lines. Conductor stringing sites would be located at approximately 2- to 3-mile intervals, would be 500 feet in length and up to 300 feet wide, and would connect 15 to 50 poles. Stringing areas located at angle points may extend beyond the standard 300-foot survey corridor and would each have a radius of approximately 600 feet. The stringing area locations would be addressed in the POD, and any additional resource studies would be completed and approved by the BLM prior to issuing the Notice to Proceed and by Reclamation prior to issuance of licenses and letters of concurrence.

Staging Areas. Approximately three staging areas, which would each be a minimum of 5 acres, would be established during construction to stage equipment and materials. The locations would be addressed in the POD, and any additional resource studies would be completed and accepted by the BLM prior to BLM issuing their Notice to Proceed.

Placement of the proposed structures and installation of the transmission lines would be conducted as follows:

Mobilization and Staging. A crew of 25 to 50 workers would mobilize to the site approximately 1 to 2 weeks prior to the start of work. During this time, they would transport equipment and construction materials to designated construction staging areas.

Preconstruction Surveying and Staking. The initial activity prior to construction is the engineering survey and staking of project facilities. This would include marking the locations of structures, anchor sites, staging and material yards (if known), wire setup sites, access roads, switching station and the substation. In addition, signs, flags, and/or fencing would be used to delineate project features, such as access and sensitive resource areas.

Once the project area is staked, any supplemental cultural surveys, preconstruction plant and wildlife surveys, as required, would be completed prior to the commencement of ground clearing as outlined in the POD. Additional staking may be required just prior to construction to refresh previously installed stakes and flagging and/or delineate any sensitive resource areas identified during the preconstruction field surveys.

Access Road Construction. Construction personnel would use numerous existing access roads to transport materials and equipment to and from the switching station, substations, transmission line corridor, staging areas, and for fiber optic installation. The following types of access roads would be used during construction:

- Existing paved roads;
- Existing dirt/gravel roads that require improvements (e.g., widening, blading, importation of materials to accommodate construction equipment);
- Temporary spur roads; and
- Centerline travel route.

SPPC would use existing access roads to the maximum extent feasible. Intermittent blading with bulldozers, graders, or equivalent machinery would be used to improve existing dirt and gravel roads for use by construction machinery. Additionally, road work outside of the permanent ROW, including creating spur roads from existing roads, may be required under a short-term ROW once the final route has been selected and project design has been completed. Any additional disturbance outside the permanent ROW would be addressed in the POD. The POD would stipulate additional resource surveys that may be required by BLM in order for SPPC to obtain a Notice to Proceed for activities not previously analyzed. All areas temporarily disturbed during construction activities would be reclaimed following project development.

To accommodate temporary centerline travel routes along the transmission line ROW, a temporary 10-foot-wide centerline travel road would be used. In areas where vegetation removal is necessary, vegetation would be cleared, primarily by a mower or hydroaxe, leaving the root systems intact to allow for soil stabilization and possible regrowth. Intermittent blading of the ROW may be necessary to ensure that rubber-tired equipment can traverse the terrain. Any excess soil would be retained for reclamation post construction.

ROW Preparation. In order to establish work areas (i.e., staging and stringing areas) where poles and conductors would be stored and/or installed, vegetation clearing, topsoil removal and protection, and grading within the ROW may be necessary. In all locations, vegetation removal would be minimized to the maximum extent possible. In order to stage equipment and conduct work, the structure work areas and stringing sites would require a relatively flat surface; therefore, the areas may be graded and gravel and/or soil may be imported to achieve the necessary elevation. The imported gravel and/or soil would be removed upon completion of construction, and the topsoil would be replaced.

Structure Placement. Materials such as transmission poles, insulators, hardware, and guy wire anchors would be delivered from the staging areas to each transmission structure site. Assembly crews would attach insulators, travelers, and hardware to form a complete structural unit. H-frame structures would consist of two direct-buried poles connected by an "X-brace," with a horizontal cross-arm member mounted above the brace to support the electrical transmission lines. Three-pole structures would consist of three direct-buried poles supported by guy wires with 40- to 60-foot guy leads and soil anchors. Single-pole structures would consist of a direct-buried steel pole, with angles supported by guy wires and soil anchors. Self-supporting steel poles would be placed on concrete foundations within the City of Fallon or where guy wires would cause conflicts with existing land uses. Erection crews would place the assembled structures into excavated holes using a large mobile crane. The poles for the H-frames, three-pole angle structures, and single-pole tangents would be set in holes that are approximately three feet wide and ten feet deep, which are drilled by a truck-mounted auger or equivalent piece of equipment. These holes would be backfilled with native or imported materials or concrete. Guy wires to support the angle poles would be used to plumb the structures. As a safety precaution, guy wires would be made more visible if they cross over designated access roads. Signs, flagging, or other marking would be used to indicate the presence of guy wires. Where self-supporting steel angle poles are required, a concrete foundation would be poured, and the pole would be secured to the concrete foundation with anchor bolts. The size of the concrete foundation would depend on the loading at each individual structure and the type of soil encountered. Typical concrete foundations are expected to be 6 to 8 feet in diameter and 20 to 30 feet deep.

Conductor Placement. The installation of conductors and shield wires requires the following four-step process:

1. Install crossing structures (where necessary);

2. Install sock line (wire pull ropes);
3. Pull conductors and shield wires; and
4. Sag and connect conductors and shield wires.

Prior to installing the proposed overhead 230-kV conductor, temporary wooden pole crossing structures would be installed at road crossings and other locations where the proposed conductor could come in contact with existing electrical and communication facilities or vehicular and/or pedestrian traffic in the event the line accidentally falls during stringing operations. An auger would be used to excavate the holes where the crossing structures would be installed, and a crane would lift the structures into place. No concrete foundations would be required to set the crossing structures.

The temporary crossing structures would be removed following the completion of conductor-stringing operations, and the holes would be backfilled with excavated soil. As an alternative to crossing structures, flaggers may be used to temporarily hold traffic for brief periods of time while the overhead line is installed at road crossings. Travelers would be attached to the insulators prior to pole setting. The travelers allow the conductor to be pulled between poles until the entire line is ready to be clipped in and pulled up to the final tension position. Conductor-stringing operations would begin by pulling a sock line (a small cable used to pull the conductor) onto the travelers from pole to pole using aerial manlifts or a construction vehicle traveling along access roads or the centerline travel route. Once the sock line is installed, it would be attached to reels of conductor or shield wire at the wire setup sites and pulled through in the reverse direction back through the travelers.

During the pulling process, enough tension would be maintained to keep the wires above ground, avoiding any damage to the conductors due to dragging. After the conductors and shield wires have been strung, they would be sagged to the proper tension and clipped into the insulators.

Site Cleanup and Demobilization. Surplus materials, equipment, and construction debris would be removed at the completion of construction activities. All man-made construction debris would be removed and disposed of appropriately at permitted landfill sites. Cleared vegetation would be shredded and distributed over the ROW as mulch and erosion control or would be disposed of offsite, depending on landowner and agency agreements. Rocks and topsoil removed during access road grading and foundation excavation would be redistributed over the ROW to resemble adjacent site conditions.

Restoration and Reclamation. After construction has been completed, all existing roads would be left in a condition equal to or better than their preconstruction condition, as directed by the BLM or private landowner, as applicable. Additionally, all other areas disturbed by construction activities, including temporary access and spur roads, would be recontoured, decompacted, and seeded or left in place as directed by the BLM or private landowner. Excess soil removed during construction would be replaced.

BLM-approved seed mixes would be applied to these disturbed areas. SPPC would attempt to close or restrict vehicle access to areas that have been seeded until the reclamation success criteria have been achieved.

The staging areas would be restored to the condition they were in prior to the start of construction or as otherwise agreed upon by SPPC and the property owner. SPPC would not leave the site in a condition that would cause nuisance, dust, or weed infestation. If unspecified by the owner, reclamation would be in accordance with the POD.

After construction has been completed, SPPC would require a permanent ROW of 125 feet (62.5 feet on either side of the centerline) for the H-frame pole line and 60 feet (30 feet on either side of the centerline) for the single pole line along the length of the 230-kV transmission line in order to conduct operations and maintenance activities.

60-kV Electric Line Folds

Two existing 60-kV transmission lines currently run east-west along Sheckler Road on their way to the Fallon Substation. These two lines pass in front of and would be “folded” into the new Greenwave Substation. The folds would be constructed on four new single-pole angle structures directly across the street from the new substation. The four 60-kV transmission lines would cross over Sheckler Road and would be conductored with twelve 397.5 thousand circular mills (MCM) aluminum conductors, each 0.72 inch in diameter and tied to the existing power poles.

Construction of the electric line folds would take place within the existing 60-kV transmission line ROW, the Sheckler Road ROW, and on the Greenwave property. SPPC construction methods would be the same as identified for the 230-kV transmission line.

After construction has been completed, SPPC would require a permanent ROW of 100 feet (50 feet on either side of the centerline) for the 60-kV transmission lines in order to conduct operations and maintenance activities.

Communications

The 230-kV transmission system would require redundant and diverse communications paths for the control and protection of the line. The new 230-kV transmission line would be constructed with an integral fiber optic cable as part of the basic design that would provide the primary protection path.

The communication system would also have microwave systems to provide the secondary communication path for the line. The Bass Flat Switching Station would have a 110-foot microwave tower to allow communication with the

SPPC Microwave site at Eagle Ridge. There would also be fiber optic connections made from the proposed Greenwave Substation to the SPPC fiber cable located along Highway 50. The connection to Greenwave Substation would be approximately 1.3 miles on existing pole lines along Allen Road.

Operation and Maintenance

SPPC proposes to have the transmission lines and associated facilities operational and in service by December 2013. Operations and maintenance would implement the appropriate procedures and mitigation measures as outlined in the POD. SPPC would conduct annual inspections of the transmission line. Annual inspections would be conducted using helicopters, all-terrain vehicles, and/or line trucks. The inspections would involve a visual review of the line along a path that is roughly parallel to the centerline and along existing dirt access roads.

In addition to the annual inspections, SPPC operations and maintenance personnel would conduct structure-climbing inspections every 10 years. These inspections would include accessing each transmission structure site using four-wheel-drive vehicles on existing dirt access roads. At each structure site, SPPC personnel would climb the structure to inspect the integrity and condition of the hardware and insulators.

Trees that could interfere with the safe operation of the transmission line would be trimmed or removed as needed over the life of the project. Implementing appropriate procedures and mitigation measures outlined in this EIS would be included in the POD.

SPPC personnel would also require access to the line in the event of an emergency situation or if maintenance of a transmission structure is necessary. Under these circumstances, the transmission line would be accessed by line trucks using existing dirt access roads and/or centerline travel route or by helicopter.

Sierra Pacific Power Company - No Action

Under the No Action Alternative, the project would not be implemented. The No Action Alternative would not meet the stated purpose and need; however, it is carried forward for detailed analysis in accordance with CEQ guidance in order to provide a benchmark against which impacts from the action Alternatives can be evaluated (40 CFR 1502.11[d]).

Ormat Technologies Proposed Action– Carson Lake Geothermal Project

Summary

The Proposed Action includes development of the Carson Lake Binary Power Plant and Substation, the Macari Switching Station, a 230-kV transmission line between the Carson Lake Substation and the Macari Switching Station all within a private 80 acre parcel. Up to 13 well pads (in addition to the 9 previously approved well pads on Reclamation land) associated pipelines and roads would also be constructed. Ormat would adhere to the lease stipulations identified in **Appendix B**, Lease Stipulations and Conditions of Approval, during construction and operation of the project. Ormat would finalize the POU prior to construction of their power facilities, similar to the SPPC POD. Implementing appropriate procedures as identified in **Appendix E**, Environmental Protection Measures and Best Management Practices, and mitigation measures outlined in this EIS would be included in the POU. All construction and operation activities associated with Ormat's geothermal development would comply with Clean Air Act (CAA) §112(r) and Emergency Planning and Community Right-to-Know Act (EPCRA) §§ 303,311, & 312.

Table 2-2, Carson Lake Geothermal Development Proposed Project Facilities, outlines the proposed project components. **Appendix A**, Typical Geothermal Resource Development and Transmission Tools, explains the functions of these components in further detail. **Figure 2-7**, Ormat Power Company's Proposed and Alternative Project Facilities, shows the locations where each component would be located.

Figure 2-8, Land Status of Ormat Project Area, shows the land ownership status for all lands within the project area.

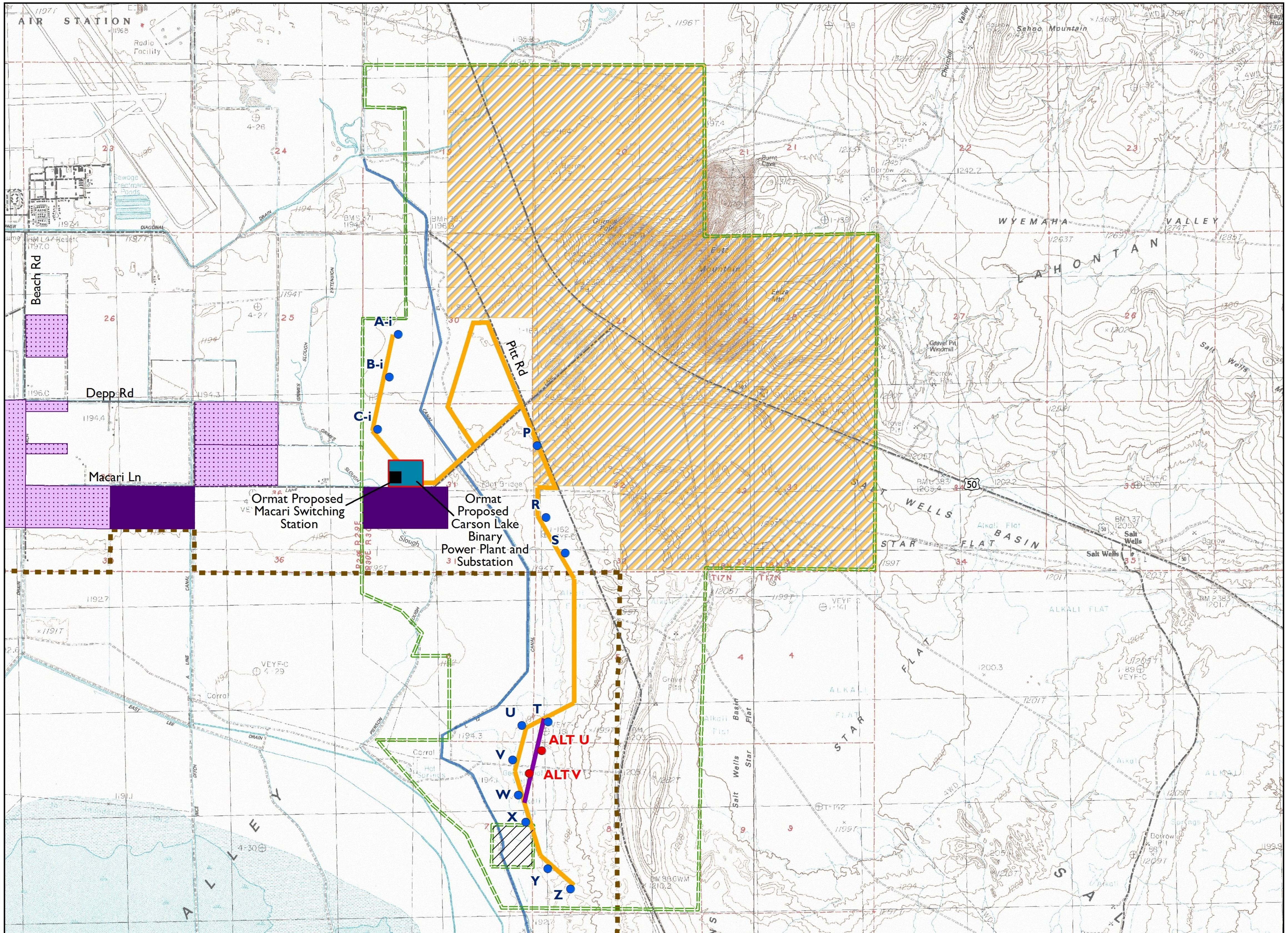
Carson Lake Binary Power Plant

The proposed binary geothermal power plant facility would be designed to produce 40 MW of electricity. The combined air- and wet-cooled power plant systems and equipment would be designed and selected for a commercial life of 30 years. The power plant would be sited on private land, just southeast of NAS Fallon (Figure 2-7). The power plant would require 15 acres for the generator and the maintenance area. The entire construction area, including the Carson Lake Substation and the Macari Switching Station, would be 30 acres with at least 10 acres reclaimed for a total permanent disturbance of 20 acres. Table 2-2 provides details on the Carson Lake Binary Power Plant location and major components.

Plant Construction

After the initial project survey and power plant layout has been established, clearing and grubbing would take place, and topsoil would be stockpiled and revegetated after completion of the project to save for future reclamation of the site. Grading and fill activities necessary for the power plant and substation would run 3 to 4 weeks.

The power plant location is topographically flat and would necessitate fill to a depth of approximately 24 inches with six inches of gravel surfacing placed after final grading of the site. Grading design would be based on local topography as shown on topographic maps.



Ormat Proposed and Alternative Project Facilities

Churchill County, Nevada

Ormat Facilities
- Ormat Project Area Boundary
- Proposed Well Pad
- Alternative Well Pad
- Proposed Pipeline
- Alternative Pipeline
- Proposed Power Plant and Substation

Other Features
- Proposed Switching Station
- CLP Title Transfer
- No Surface Occupancy
- Newlands Project Canal
- Existing Conservation Easement
- Proposed Conservation Easement
- Excluded from Lease Area

Source: BLM 2010, Churchill County 2010, Ormat 2010, US Navy 2011a

0 0.25 0.5
Miles

N

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-7

This page intentionally left blank.

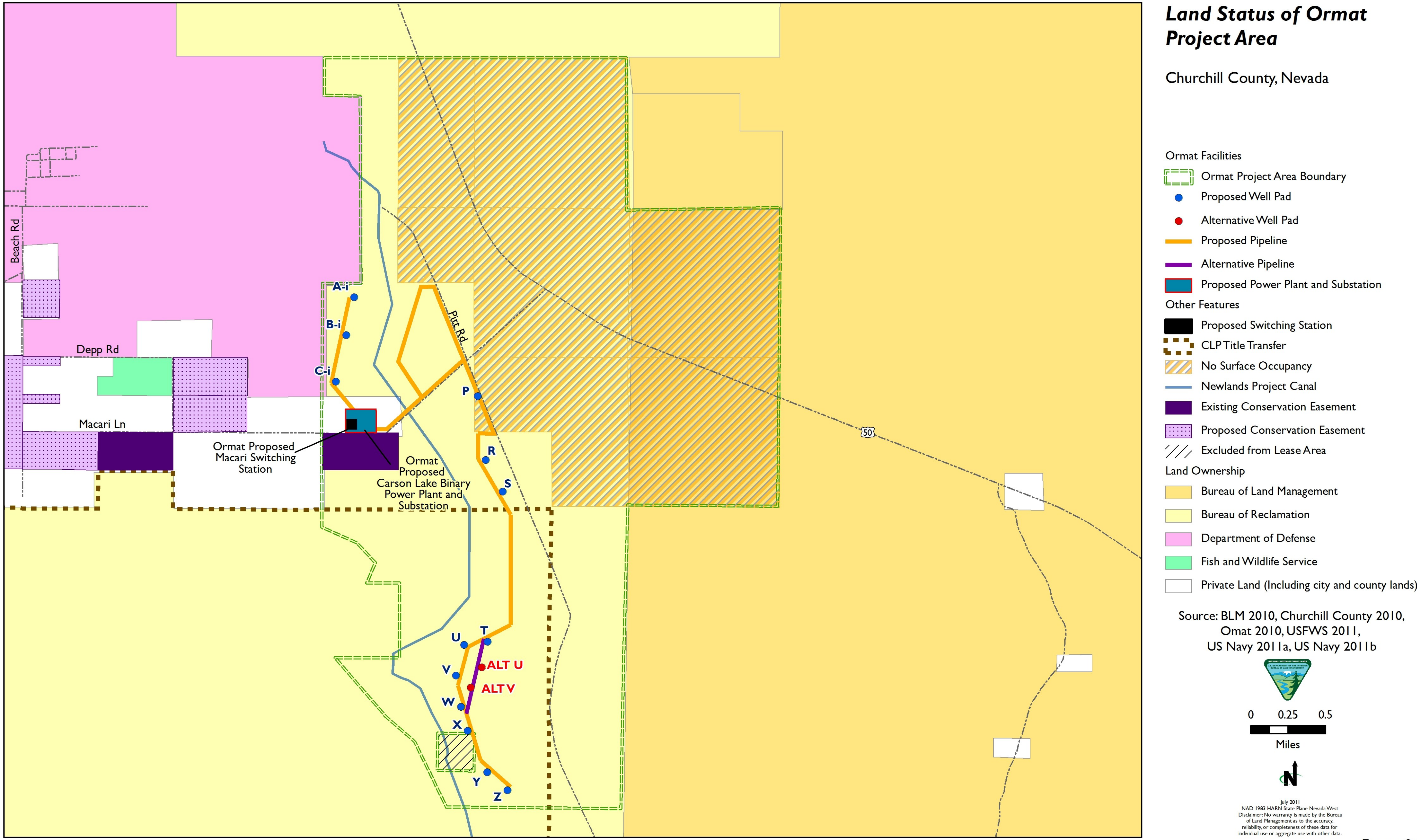

Land Status of Ormat Project Area
Churchill County, Nevada
Ormat Facilities
Ormat Project Area Boundary
Proposed Well Pad
Alternative Well Pad
Proposed Pipeline
Alternative Pipeline
Proposed Power Plant and Substation
Other Features
Proposed Switching Station
CLP Title Transfer
No Surface Occupancy
Newlands Project Canal
Existing Conservation Easement
Proposed Conservation Easement
Excluded from Lease Area
Land Ownership
Bureau of Land Management
Bureau of Reclamation
Department of Defense
Fish and Wildlife Service
Private Land (Including city and county lands)
Source: BLM 2010, Churchill County 2010, Omat 2010, USFWS 2011, US Navy 2011a, US Navy 2011b
0
0.25
0.5
Miles
N
July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.
Beach Rd
Depp Rd
Macari Ln
Pitt Rd
50
Ormat Proposed Macari Switching Station
Ormat Proposed Carson Lake Binary Power Plant and Substation
A-i
B-i
C-i
P
R
S
T
U
V
W
X
Y
Z
ALT U
ALT V

Figure 2-8

This page intentionally left blank.

Table 2-2
Carson Lake Geothermal Development Proposed Project Facilities

Project Component	Description/Location	Temporary Disturbance	Permanent Disturbance
Carson Lake Binary Power Plant	The power plant would be a combination wet- and air-cooled power plant and would be located on private land owned by Ormat. The location where the power plant would be built is shown on Figure 2-7.	Approximately 30 acres	Approximately 20 acres
Carson Lake Binary Power Plant Substation	The substation would be located adjacent to the power plant as shown on Figure 2-7.	Approximately 0.5 acre within the footprint of the Carson Lake Binary Power Plant site.	Approximately 0.5 acre within the footprint of the Carson Lake Binary Power Plant site.
Macari Switching Station	Immediately west of the Carson Lake Binary Power Plant and Substation as shown on Figure 2-7.	Approximately 5.75 acres within the footprint of the Carson Lake Binary Power Plant site.	Approximately 5.75 acres within the footprint of the Carson Lake Binary Power Plant site.
Interconnect Transmission Line	Ormat would construct approximately 200 feet of transmission line to connect the Carson Lake Substation to the proposed Macari Switching Station.	Length: 200 feet Corridor Width: 300 feet Total Area of Disturbance (within Carson Lake Binary Power Plant site): ~ 0.6 acres	Length: 200 feet Corridor Width: 125 feet Total Area of Disturbance (within Carson Lake Binary Power Plant site): ~ 0.6 acres
Pipelines	The final pipeline corridor width would be 155 feet (100 feet wide to accommodate the expansion joints, 5 feet for pipeline, and 50 feet for road).	Length: 6.5 miles Corridor Construction width: 300 feet Total Area of Disturbance: 236.36 acres	Length: 6.5 miles Corridor width: 155 feet Total Area of Disturbance: 122 acres
Well Pads	Up to 13 new well pad locations would be built as shown on Figure 2-7. Well pads would accommodate multiple wells (i.e., production, injection, and/or observation wells).	13 well pads at 4.2 acres each: 54.6 acres	13 well pads at 4.2 acres each: 54.6 acres
Access Roads	Access roads would extend from existing unpaved roads to project components as shown in Figure 2-7.	Length: 4.6 miles Width: 50 feet Total Disturbance: Approximately 11 acres within the footprint of the pipeline corridor.	Length: 4.6 miles Width: 20 feet Total Disturbance: Approximately 11 acres within the footprint of the pipeline corridor.
Total Estimated Disturbance:		**332 acres**	**208 acres**

All equipment would be brought to the project site on trucks. The power plant construction site would be accessed from US Highway 50 via Macari Lane. The facility provides for fire monitors and hydrants located in strategic locations. These units are powered by a dedicated diesel generator and would utilize on-site water storage, geothermal fluid, and or water from the cooling tower water for fire suppression. The facility and substation would be fenced with chain link fencing and security wire along the top.

Plant Operations

Ormat is proposing pentane as the working fluid. Pentane is a low-toxic flammable product. The facility circulates approximately 30,000 gallons of pentane through the system with approximately one-fourth stored in a 10,000-gallon storage tank. The storage tank receives makeup pentane, and when conducting major maintenance activities, pentane from the circulating portion of the facility is transferred to the excess capacity in the storage tank.

The power plant would include a septic system for wastewater disposal. Sanitary water supplies would be purchased and delivered by a water delivery truck and stored on site. Potable water for drinking would be provided by a local bottle water purveyor.

Cooling System

The efficiency of the power plant is largely determined by the dry bulb temperature of the ambient air, with the efficiency going down as the temperature goes up. The objective of water-assisted cooling is to reduce the dry bulb temperature and gain operating efficiency at peak energy demand intervals. Efficiencies gained for wet cooling typically provide generation increases of 25 percent. The proposed cooling systems would be a combination of a dry air cooling tower operating year round and two types of wet cooling operating when atmospheric conditions are conducive to a large vapor plume (e.g. on cold high-humidity days). The following describes the three types of cooling systems:

- Air-cooled condensers are large open-structure air-cooled heat exchangers. Large-finned tube radiators lie horizontal 20 feet above ground on steel beams. Large fans (13-foot diameter) on top of the tube assemblies draw ambient air at the dry bulb temperature up through the tubes, cooling and condensing the binary fluid flowing through the inside of the tubes. The total height for air-cooled structures is between 42 and 52 feet.
- The water-assisted air-cooled condensers system sprays water beneath the air-cooled condensers, and evaporative cooling allows air traveling to the air condensers to be cooled nearer to the wet bulb temperature, which is frequently 25 or more degrees lower, thereby increasing the efficiency and output of the facilities.

- Wet cooling consists of a traditional 45-foot tower as described in **Appendix A**, Typical Geothermal Resource Development and Transmission Tools. Operationally, portions of the hot vaporized pentane would be diverted through a water-cooled heat exchanger (condenser) where heat is transferred from the pentane to the water; the heated water is then forwarded to the cooling tower. The water is cooled in the cooling tower and is returned to the heat exchanger.

Cooling water consumption is anticipated to be 2,500 to 3,500 gallons per minute (gpm) through the operational season. Water rights would be purchased from an individual within the Truckee-Carson Irrigation District (TCID) and delivered to the site via the Reclamation irrigation canal paralleling the east property boundary. Design of the water withdrawal apparatus from the irrigation canal would be consistent with Reclamation construction and operation requirements. Ormat would need a separate authorization from the State Engineer to obtain the water rights necessary for use in the project.

A cooling tower plume typically occurs during times of high humidity when the water vapor is not readily absorbed to the atmosphere. Within the Carson Lake region, this usually occurs in the colder months when the air temperature drops and the air humidity increases. Due to the proximity of NAS Fallon operations and visual sensitivities associated with Grimes Point Archaeological Site, Ormat would generally cease operations of wet cooling when atmospheric conditions are conducive to a large vapor plume (e.g. on cold high-humidity days).

Cooling tower "drift" (a type of moisture release) results from small quantities of water droplets of 10 microns or greater and small amounts of dust and dissolved and suspended solids that become airborne when the water droplets evaporate and are carried out with the exhaust air. The facility would employ drift eliminators to control particulate emissions to levels below levels required by the NDEP, Bureau of Air Pollution Control.

Communications

In order to handle communications (command, control, voice, and Internet) at 18 gigahertz (GHz) Ethernet/T-1 speeds, Ormat would arrange to have installed an approximately 35-foot-tall microwave tower at the Carson Lake Binary Power Plant site.

Carson Lake Substation

Ormat would construct a substation on site to convert the lower voltage generated at the Carson Lake Binary Power Plant to a higher power voltage. This would then be connected to a proposed 230-kV transmission line between the substation and the proposed Macari Switching Station.

This electrical substation would be located within the 20-acre Carson Lake Binary Power Plant site and would have a footprint of approximately 300 by 200 feet. Surrounding the substation would be an 8-foot-tall chain-link fence with vehicle and personnel access gates. The surface of the substation would consist of crushed rock and would be bermed for spill containment.

The substation equipment would be installed on concrete foundation. The electrical generators at the power plant would be connected to the substation via a 13.8-kV transmission line.

Macari Switching Station

In order to connect the Ormat Carson Lake Binary Power Plant to the SPPC 230-kV transmission line, Ormat proposes to construct the Macari Switching Station. This switching station would be within the 20-acre Carson Lake Binary Power Plant site and would consist of a single radial circuit breaker. The approximate size of the switching station would be 500 feet by 500 feet (approximately 6 acres). The switching station would be constructed similar to the Bass Flat Switching Station as described under the SPPC Proposed Action, described previously.

Transmission Line

Ormat proposes to construct a 230-kV transmission line approximately 200 feet in length from the proposed Carson Lake Binary Power Plant Substation to the proposed Macari Switching Station. The transmission line would include a 230-kV transmission switch structure located between the two facilities. The line would be constructed using similar materials and methods as identified in the SPPC 230-kV transmission line proposal, described previously. In addition, a transmission line would be constructed from the Macari Switching Station to the SPPC 230-kV transmission line, which will run adjacent to the Macari site. Each structure would carry a single overhead ground wire/fiber optic cable for lightning protection and fiber-optic communications. A steel dead-end structure measuring 30 feet wide by 45 feet tall would provide a termination point for the overhead Ormat 230-kV interconnection line to the Macari Switching Station (see **Appendix A**, Typical Geothermal Resource Development and Transmission Tools).

Pipelines

The permanent gathering system for transporting hot geothermal fluid from the production wells to the power plant and from the power plant to the injection wells would use insulated pipelines located mostly on public lands. The collection pipeline system would vary in diameter from 20 to 30 inches. Piping would extend from the power plant to the well heads (Figure 2-7). The injection piping system would vary in diameter from 12 to 28 inches. Piping would extend from the power plant to the injection wells. The pipeline routes would generally follow the proposed well pad access roads, but could be located anywhere within the areas identified on Figure 2-7. The proposed construction pipeline corridor width is 300 feet to accommodate pipeline widths, expansion joints, and the access road. The final width would be 155 feet.

Construction of the pipelines may require grading of the pipeline corridor, which would allow permanent access to the pipelines for maintenance during operations. Any temporary construction access to the pipeline corridor would be reclaimed after completion of construction.

The construction phase of the pipeline would begin with excavations for the pre-fabricated pipeline supports; the pipeline would be supported every 30 feet by supports requiring a 10-square-foot footprint. Each support would be drilled with a truck-mounted auger or a similar piece of equipment. Pipe sections would be delivered and placed along the pipeline corridor and then would be lifted in place using a small crane and welded in place. When complete, the top of the pipeline would be approximately three feet above ground. Electric power and instrumentation cables would either be installed in steel conduit constructed on the pipe supports adjacent to the pipeline, or, in some locations, buried along the pipeline route. Pipelines that cross roads would be undergrounded in a "U" shaped conduit. The pipeline canal crossing along Macari Lane would be constructed to protect the canal embankment by avoiding the toe on each side of the canal. The distance from the centerline of the canal to the toe of each side is approximately 75 feet; therefore, the span of the pipeline over the canal would be approximately 150 feet. Road crossings and irrigation canal crossings would comply with the Reclamation Design Engineering and Operation and Maintenance Guidelines for crossings (Reclamation 2008). The pipeline would also provide sufficient vertical clearance for Reclamation operations and maintenance of the canal.

Well Pads

Thirteen (13) new well pads are being proposed. Because of the type of power plant proposed in this project, multiple types of wells (i.e. production, injection, and observation wells) would be necessary to provide enough geothermal fluid to operate the generator at the power plant. For this reason, the newly proposed well pads would be 400 feet by 450 feet (4.2 acres) each to accommodate the aforementioned multiple wells (see **Appendix A**, Typical Geothermal Resource Development and Transmission Tools, for a typical well pad layout). Well pads would be constructed adjacent to pipeline access roads. **Table 2-3**, Proposed Well Pads, describes the 13 proposed well pads.

Blow-out prevention equipment (BOPE) would be used to protect the human and natural environment during all exploration and production drilling phases. BOPE is further described in **Appendix A**. After completion and testing of each exploration well, Ormat would determine the best use of that well (i.e., to be used as a production, observation, or injection well). The drill rigs would be approximately 178 feet high. The drill rigs would be removed, as would much of the equipment that was necessary for well drilling. For the development phase, well pads requiring additional drilling would be equipped with a 10,000-gallon water storage truck, mud and water mixing tanks, an aboveground diesel fuel storage tank, a metal equipment building, piping, valves, pipe rack, drillers/

Table 2-3
Proposed Well Pads

Well Pad Number	Kettlemen Number	Lease Number	Township/ Range	Section
A-i	25-30	NVN 079105	T18N R30E	30
B-i	27-30	NVN 079105	T18N R30E	30
C-i	12-31	NVN 079104	T18N R30E	31
P	12-32	NVN 079104	T18N R30E	32
R	86-31	NVN 079104	T18N R30E	31
S	88-31	NVN 079104	T18N R30E	31
T	86-6	NVN 079106	T 17N R30E	6
U	88-6	NVN 079106	T 17N R30E	6
V	81-7	NVN 079106	T 17N R30E	7
W	83-7	NVN 079106	T 17N R30E	7
X	85-7	NVN 079106	T 17N R30E	7
Y	17-8	NVN 079106	T 17N R30E	8
Z	27-8	NVN 079106	T 17N R30E	8

trailers, and an unlined reserve pit. Well pads would not be fenced during construction; however, upon completion of drilling and until the site is reclaimed, the well pad and reserve pit would be fenced. Directional drilling is not feasible for the project and is not part of the proposed action or alternatives.

Each existing and/or proposed well pad site would maintain an unlined reserve pit. The reserve pits would be used for the containment and temporary storage of drill cuttings, waste drilling mud, and storm water runoff from the constructed pad. Geothermal fluid produced from the well during flow testing would also drain to the reserve pit. The reserve pit at each well pad would be approximately 100 feet long by 300 feet wide by up to 8 feet deep, and would have a capacity of up to 1.5 million gallons. The pits would be unlined because the naturally occurring clay content in the drilling muds that flow into the reserve pit would seal the pit, preventing drilling fluids and other liquid run-off from percolating into local groundwater. The pit would be covered with netting and fenced.

Wells

Production Wells. After the exploration phase is completed, production wells could be drilled and constructed in the next phase of development. Wells that were constructed in the exploration phase that are capable of commercial production would be converted to production wells. Proposed production wells would be drilled on 400-foot by 450-foot well pads, as previously described. No production or injection wells are planned on Navy lands under the proposed action. If the Navy decides to move forward with development of the three well pads, associated roads and wells on Navy property that were previously analyzed under the Carson Lake Exploration EA (EA-NV-030-07-006), additional NEPA analysis by the Navy would be required.

Production wells would be constructed to total depths of 1,500 to 10,000 feet. Wellhead dimensions are not expected to exceed a height of five feet above ground or be more than 36 inches in diameter.

During drilling operations, a minimum of 10,000 gallons of cool water and 12,000 pounds of inert, nontoxic, non-hazardous barite (barium sulfate), in addition to other drilling fluids would be stored at the well site for use in preventing well flow ("killing the well"), as necessary.

The well bore would be drilled using non-toxic, temperature-stable drilling mud composed of a bentonite clay-water or polymer-water mix for all wells. Variable concentrations of additives would be added to the drilling mud as needed to increase mud weight, and prevent mud loss. Additional drilling mud would be mixed and added to the mud system as needed to maintain the required quantities.

Compressed air may be added to the drilling mud, or used instead of drilling mud, to reduce the weight of the drilling fluids in the hole and assist in carrying the cuttings to the surface. The air, any drilling mud, rock cuttings, and any reservoir fluids brought to the surface would be diverted through the separator/rock muffler to separate and discharge the air and water vapor to the air and the drilling mud and cuttings to the reserve pit.

Drilling additives expected to be used in the Ormat drilling muds include:

- Barite (drilling fluid densifier), containing 91 to 93 percent barite, 4 to 6 percent silica (SiO_2) and 1 to 5 percent mica;
- Drispac Regular (polymer viscosifier – water loss control agent), the composition of which is unknown due to its proprietary nature;
- Fiber Seal F-C, which consists of ground almond shells;
- Volclay Premium Gel, comprised of crystalline quartz;
- Geo Zan, comprised of xanthan gum;
- Anionic polyacrylamide in a water-oil emulsion, which is a petroleum distillate;
- Saw dust, comprised of wood dust; and
- Sodium chloride, which is standard table salt.

Drilling additives vary due to the wide range of products available on the market that achieve the various desired characteristics of drilling muds. The quantity of drilling mud varies widely depending on the nature of each drill hole, and as such, the quantity of drilling additives also varies. Sample quantities of drilling additives were provided by Ormat for a 40-day drilling project at Mammoth Lakes, California, in October 2010. Of the 40 days of drilling, only five of those days required the addition of drilling fluids. The following list provides the quantities of the various additives that were used over those five days (note that some of the additives are the same as those projected for this project, listed above, and some are different):

- Gel: 171,500 pounds
- Cotton seed pellets: 10,000 pounds
- Salt: 9,600 pounds
- Premium seal: 2,500 pounds
- Geo Pac R: 2,050 pounds
- Geo Zan: 1,350 pounds
- DMA: 950 pounds
- Caustic Soda: 900 pounds
- Soda Ash: 850 pounds
- BiCarb: 650 pounds
- Omnipol: 20 gallons
- Saw dust: 303 cubic feet

No diesel fuel is used down-hole. Typically, three tubes of grease are used per day to lubricate the bearings in the drill rig. Oil in the drill-rig engine is typically changed every 30 days. Hydrochloric acid (HCl) is typically onsite in quantities of less than 16 ounces, and is used for logging subsurface specimens.

All drilling would be done in full compliance with Nevada Administrative Code Chapters 534 and 534A, with specific attention given to prevention of contamination of fresh water and geothermal aquifers, as defined by Nevada Administrative Code 534.095. Drilling and plugging of all holes would be done in a manner to prevent cross-contamination of the fresh water and geothermal aquifers.

Injection Wells. Ormat proposes to develop injection wells at Well Pads A-i, B-i, and C-i, as shown on Figure 2-7. However, additional injection wells may be located on proposed well pad sites or located as necessary to maintain geothermal reservoir pressures and temperatures. Injection wells would be drilled on 400-foot by 450-foot well pads, as previously described. Approximately four injection wells would be drilled. Injection wells are expected to be completed between a depth of 1,500 and 9,500 feet, depending on the results of exploration. Each injection well would each be drilled and cased to the depth selected by the project geologist.

Observation/Monitoring Wells. Wells not used for production or injection may be used for monitoring the geothermal reservoir. Well pads and access to any wells used as observation wells would be maintained from the exploration phase. No new work would be required.

Access Roads

Existing access roads would be used to the extent feasible. The Ormat Project Area would be accessed from Highway 50 via Macari Lane and Berney Road. Ormat would not use the historic, unaltered section of the Lincoln Highway or old Highway 50 (west of Highway 50, north of Macari Lane) to access the project site. A network of unpaved main access roads exists in the area; these roads would be used as principle travel routes to access roads to individual well pads. These existing unpaved principle access roads would require maintenance during exploration, development, and operation phases and may include the application of gravel to repair damage from traffic during periods of rainfall or snow. To control dust and stabilize the road surface, it may be necessary to apply BLM-approved dust abatement tackafiers.

Access to the power plant and substation would be within the Carson Lake Binary Power Plant footprint and located off of Macari Lane.

Access road construction would be similar to those methods described under the SPPC proposal, including clearing brush and bringing the surface to grade by grading the surface and adding gravel where required. Approximately 4.6 miles of access roads would be collocated along pipeline corridors and would be used as main thoroughfares to well pads and the power plant site. The overall construction width of any newly developed access road would be 50 feet with a post construction width of 20 feet. Proposed access roads to the power plant site, pipe routes, and well pads would have a construction width of 50 feet to accommodate passing and turnarounds. The access roads that remain after construction would be approximately 15 feet wide with 2.5-foot shoulders. Some passing turnout lanes may remain for future operations and maintenance. Vehicle turnarounds would be located on the well pads. The roads would have a design speed of 10 to 30 miles per hour, built to carry highway loads. The access roads would be maintained by Ormat during construction and operation of the facilities as provided for in the POU.

Material for Construction Fill and Base

Material would be purchased for construction of well pads, access roads, and the power plant (such as construction fill, aggregates, concrete, and asphalt) from local sources. Ormat would not access BLM material sites nor establish on-site processing facilities for construction purposes.

Workforce

The power plant construction would likely require a maximum of 50 workers at peak but would average about 25 on site for the duration of the 8 to 12-month construction period.

Construction of the well field pipelines would require 35 workers over a period of approximately 9 months. Pipelines would be constructed after the wells are drilled and before the power plant begins operation.

Decommissioning and Reclamation

At the end of the project lifespan, the power plant and all related facilities would be decommissioned and the project site would be restored to its pre-project condition. As part of the Proposed Action, Ormat will provide proof of bonding prior to any surface disturbing activities in accordance with 43 CFR 3200 (see Appendix A).

Ormat Technologies – No Action

Under the No Action Alternative, the geothermal binary power plant and associated facilities would not be constructed. The No Action Alternative would not facilitate geothermal development or meet the stated purpose and need. The No Action Alternative is carried forward, however, for detailed analysis in accordance with CEQ guidance to provide a benchmark against which impacts from the action Alternatives can be evaluated (40 CFR 1502.11[d]).

Vulcan Proposed Action– Salt Wells Geothermal Development Project (Preferred)

Summary

Vulcan is proposing up to four power plants and associated substations at five possible locations. In addition, a 230-kV interconnection transmission line would be constructed to connect the power plant(s) to Vulcan's proposed Bunejug Switching Station. Vulcan would also construct up to 26 new well pads and associated wells, roads, and pipelines. All construction and operation activities associated with Vulcan's geothermal development would comply with Clean Air Act (CAA) §112(r) and Emergency Planning and Community Right-to-Know Act (EPCRA) §§ 303,311, & 312.

Vulcan's proposed project has similar components to those described under the Ormat project proposal. To eliminate redundant descriptions, the similar construction methods can be found under the Ormat project.

Table 2-4, Vulcan Salt Wells Proposed Project Facilities, describes the major components of Vulcan's Proposed Action. Vulcan would adhere to the lease stipulations identified in **Appendix B**, Lease Stipulations and Conditions of Approval, during construction and operation of the project. Vulcan would also finalize the POU/POD prior to construction of their power facilities. Implementing appropriate procedures, as identified in **Appendix E**, Environmental Protection Measures and Best Management Practices, and mitigation measures outlined in this EIS would be included in the POU. **Figure 2-9**, Vulcan Power Company's Proposed and Alternative Project Components, shows the location of the Vulcan facilities.

Table 2-4
Vulcan Salt Wells Proposed Project Facilities

Project Component	Description/Location	Temporary Disturbance	Permanent Disturbance
Proposed Power Plants	Site 1: 2.3 miles south of US Highway 50 and accessed via the main road from the Salt Wells intersection Site 2: 2.9 miles south of US Highway 50 and accessed via the main road from the Salt Wells intersection Site 3: 4.1 miles south of US Highway 50 and accessed via Pit Road Site 4: 0.3 mile south of US Highway 50 and accessed via the main road from the Salt Wells intersection Site 5: 6.6 miles south of US Highway 50 and accessed via Pit Road	A maximum of 4 power plants would be constructed. Each power plant site would result in 23.5 acres of disturbance, including laydown areas. 23.5 acres (including a 5-acre laydown area) x 4 power plants = 94 acres	A maximum of four power plants would be constructed. Each power plant site would result in 23.5 acres of disturbance, including laydown areas. 23.5 acres (including a 5-acre laydown area) x 4 power plants = 94 acres
Proposed Power Plant Substations	One on each power plant site (see Proposed Power Plant Substations). See Figures 2-9 through 2-14	One on each power plant site. Each substation would occupy approximately 1.4 acres within each 23.5-acre power plant site. 1.4 acres x 4 power plants = 5.6 acres	One on each power plant site. Each substation would occupy approximately 1.4 acres within each 23.5-acre power plant site. 1.4 acres x 4 power plants = 5.6 acres
Proposed Bunejug Switching Station	Bunejug Switching Station See Figures 2-9 through 2-14.	5.75 acres	5.75 acres
Interconnect Transmission Lines	From selected power plants to the proposed Bunejug Switching Station.	Maximum buildout with the total length of the possible interconnect transmission lines of 7.9 miles. Temporary Corridor Width: 300 feet 7.9 miles (41,712 feet) x 300 feet = 12,513,600 square feet (287 acres) (temporary)	Maximum buildout with the total length of the possible interconnect transmission lines of 7.9 miles. Permanent Corridor Width: 125 feet 7.9 miles (41,712 feet) x 125 feet = 5,214,000 square feet (120 acres) (permanent)

Table 2-4
Vulcan Salt Wells Proposed Project Facilities

Project Component	Description/Location	Temporary Disturbance	Permanent Disturbance
Pipelines	The permanent pipeline corridor would be 155 feet (100-foot-wide joint, 5 feet for pipeline, and 50 feet for road). See Figures 2-9 through 2-14.	Maximum buildout with the total length of possible pipelines of 19.2 miles. 19.2 miles (101,375 feet) x construction width of 300 feet = 30,412,500 square feet (698 acres)	Maximum buildout with the total length of possible pipelines of 19.2 miles. 19.2 miles (101,375 feet) x 155 feet = 15,713,125 square feet (361 acres)
Well Pads	Up to 26 well pad locations would be built as shown in Figures 2-9 through 2-14 and described in Table 2-6.	Maximum buildout of 26 well pads at 4.2 acres each. 26 well pads x 4.2 acres = Approximately 109 acres	Maximum buildout of 26 well pads at 4.2 acres each. 26 well pads x 4.2 acres= Approximately 109 acres
Geothermal Wells	Production: Approximately 8 per binary power plant and 14 per flash power plant Injection: Approximately 4 per binary power plant and 7 per flash power plant Observation/Monitoring: None See Figures 2-9 through 2-14.	Included in well pad disturbance footprint above.	Included in well pad disturbance footprint above.
Water Wells	Five (5) wells would be required for construction and operation of each 30-MW power plant and its associated facilities (roads, well pads, pipelines, etc.). For maximum build-out (four 30-MW power plants), up to 20 wells could be required. Water wells would be located within a 1-mile radius of their respective power plant site or within an area near the existing well 58-9.	50-foot radius of disturbance around each water well head (0.2 acre) 1 mile of 20-foot-wide corridor for road and pipe (2.5 acres) per well 3 acres of disturbance per water well For maximum buildout, approximately 60 acres of disturbance.	50 foot radius of disturbance around each water well head (0.2 acre) 1 mile of 20-foot-wide corridor for road and pipe (2.5 acres) per well 3 acres of disturbance per water well For maximum buildout, approximately 60 acres of disturbance.
Well Pad Access Roads	See Figures 2-9 through 2-14.	Disturbance acres are included in the pipeline corridor area of disturbance.	Disturbance acres are included in the pipeline corridor area of disturbance.
Total Estimated Disturbance:		**1,260acres**	**756 acres**

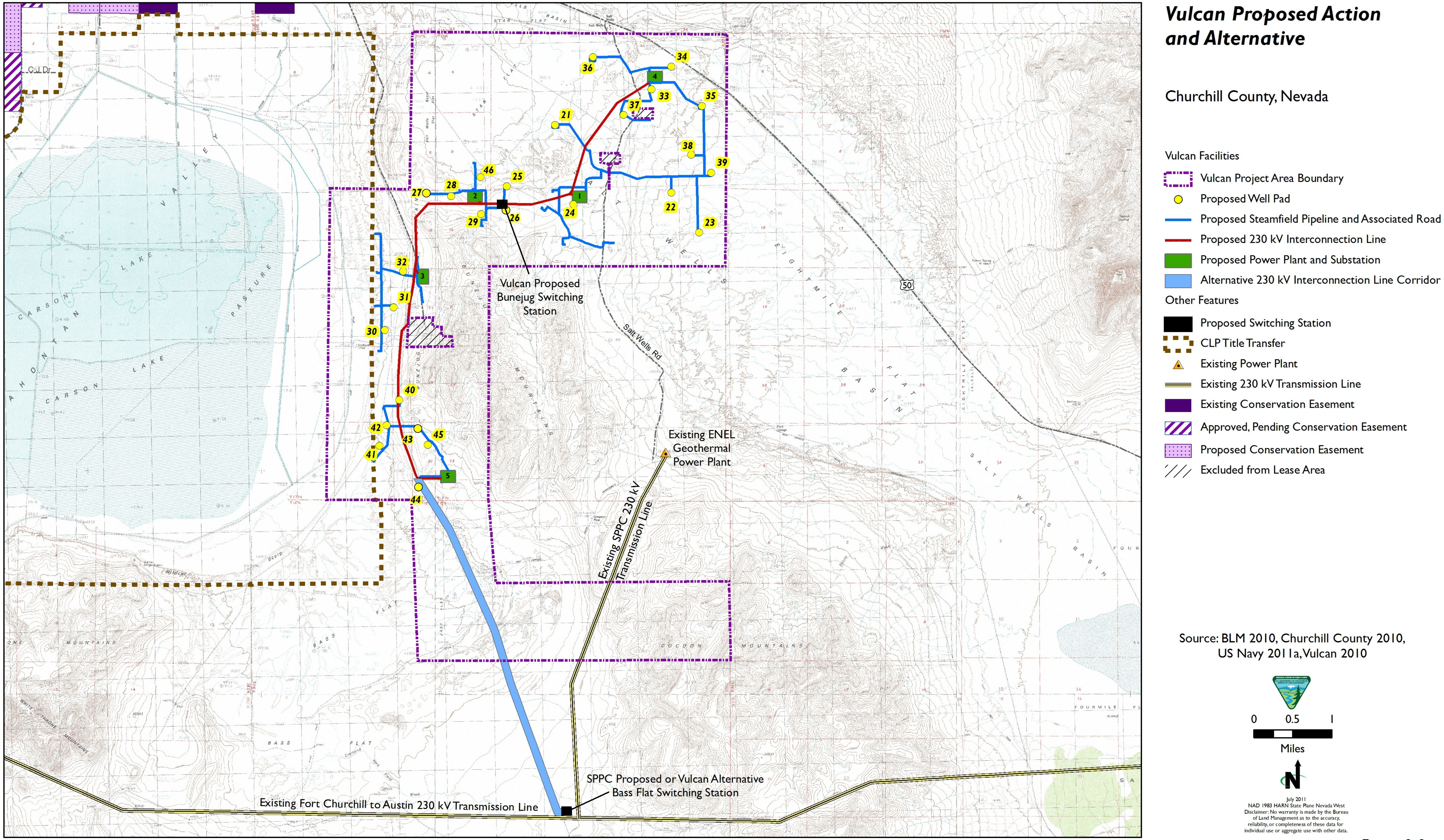

Vulcan Proposed Action and Alternative
Churchill County, Nevada
Vulcan Facilities
Vulcan Project Area Boundary
Proposed Well Pad
Proposed Steamfield Pipeline and Associated Road
Proposed 230 kV Interconnection Line
Proposed Power Plant and Substation
Alternative 230 kV Interconnection Line Corridor
Other Features
Proposed Switching Station
CLP Title Transfer
Existing Power Plant
Existing 230 kV Transmission Line
Existing Conservation Easement
Approved, Pending Conservation Easement
Proposed Conservation Easement
Excluded from Lease Area
Source: BLM 2010, Churchill County 2010, US Navy 2011a, Vulcan 2010
0 0.5 1
Miles
Vulcan Proposed Bunejug Switching Station
Existing ENEL Geothermal Power Plant
Existing SPPC 230 kV Transmission Line
SPPC Proposed or Vulcan Alternative Bass Flat Switching Station
Existing Fort Churchill to Austin 230 kV Transmission Line
Salt Wells Rd
July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-9

This page intentionally left blank

Figure 2-10, Land Status of Vulcan Project Area, shows the land ownership status of all lands within the project area.

Power Plants

Vulcan proposes to develop up to three nominal 30-MW (net) binary geothermal power plants at Power Plant Sites 1, 2, and 4 and either 30-MW (net) binary or 60-MW (net) flash power plants at Power Plant Sites 3 and 5 (**Figures 2-11** through **2-14**, Vulcan Power Company Salt Wells Project – Proposed Sites and Wells) for a maximum output of 120 MW (net).

Proposed Binary Power *Plant*. Vulcan is proposing up to four 30-MW (net) geothermal binary power plants; one each at five potential locations (Figure 2-9) using a combination wet- and/or air-cooled technology. The cooling system technology would be similar to that proposed under Ormat's Carson Lake Binary Power Plant proposal. Vulcan may use wet- and/or air-cooled technology. Each proposed binary power plant would occupy an 18.4-acre site situated within a 40-acre Survey Area. Each binary power plant site would produce approximately 30-MW (net) output from three 15-MW (gross) turbine-generator sets. Each power plant site would be fenced. The proposed 18.4-acre sites would be large enough to accommodate all the necessary facilities in the power-generating units.

Water Requirements. Vulcan would not require any surface water or purchased water for the Salt Wells geothermal power plants during normal operations. Groundwater wells and/or geothermal fluid from the geothermal reservoir would be used as the primary source for cooling water. **Table 2-5**, Vulcan's Proposed Salt Wells Project Estimated Water Consumption, summarizes the approximate water consumption for each type of power plant and the amount needed under total buildout scenarios.

Table 2-5
Vulcan's Proposed Salt Wells Project Estimated Water Consumption

Proposed Build Out	Consumptive Use (acre-feet/ year)
1-30 MW Binary Power Plant	3,300
1-60 MW Flash Power Plant	5,500
4-30 MW Binary Power Plants	13,200
2-30 MW Binary Power Plants and 1-60 MW Flash Power Plant	12,100

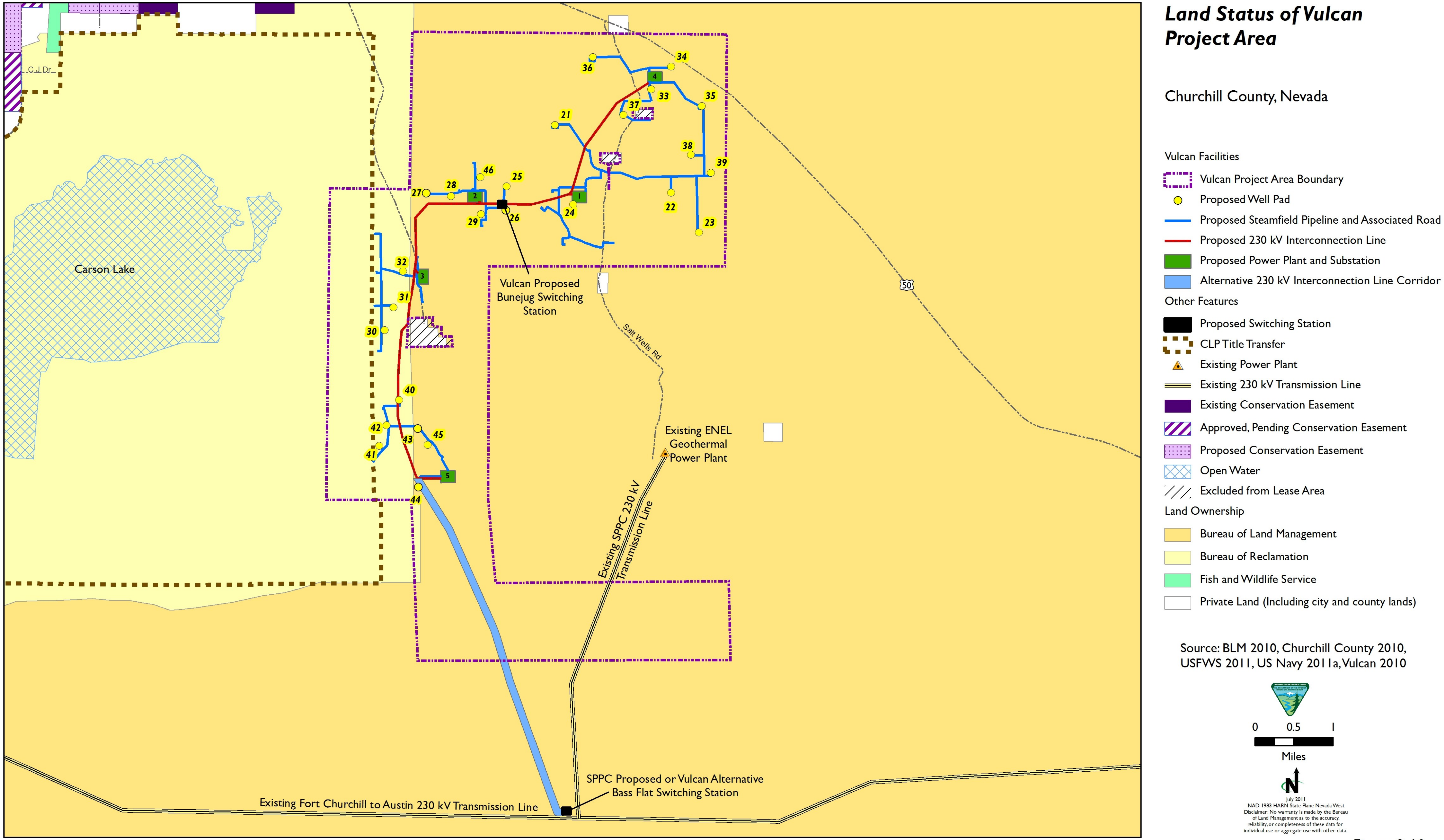
Drilling results from existing exploration Well 58-9, located in Section 9 of Township 17 North, Range 30 East (EA-NV-030-07-05) indicates a zone of cold water at a depth of approximately 750 feet. Vulcan proposes to drill additional groundwater wells in the area of Well 58-9. Vulcan is planning to drill and test other wells in the areas described previously in order to supplement that of Well 58-9 and satisfy the cooling water requirements for the first two 30-MW (net) binary power plants. Vulcan plans to use similar wells for the power plants on the west side of the Bunejug Mountains. The project areas on the west side of the mountains are in a larger sub basin with surface water resources and irrigated agriculture. Vulcan expects that this sub basin would be sufficient to support the proposed development at Sites 3 and 5. Vulcan would need a separate authorization from the State Engineer to obtain the water rights necessary for use in the project.

Plant Construction. Construction methods would be similar to those proposed under the Ormat proposal and can be found under the pertinent section.

Plant Operation. Typical binary power plant operations are similar to those identified in the description of the Ormat Carson Lake Binary Power Plant.

During operation, some of the circulating cooling water is lost to evaporation and must be replaced. On a hot dry summer day, it is estimated that approximately 2,500 gpm of the circulating cooling water would be lost to evaporation from the cooling towers (based on a 30-MW [net] binary power plant). During the nighttime hours of the summer and winter, it is expected that the evaporation loss would be significantly less. Although the major equipment is not yet selected, the average annual evaporation is expected to be approximately 2,000 gpm for each 30-MW (net) power plant, or less than 3,300 acre-feet (ac-ft) per year. The potential consumptive use per year is 3,300 ac-ft for each 30-MW (net) power plant. Additionally, a small amount of cooling water would be blown down from the cooling tower basin to maintain suitable water chemistry during commercial operation. This blow-down water would be injected into the reservoir. Evaporation loss and blow-down represent the total amount of replacement water that would be required. Vulcan proposes using groundwater wells and/or geothermal fluid from the geothermal reservoir to satisfy the replacement water demand.

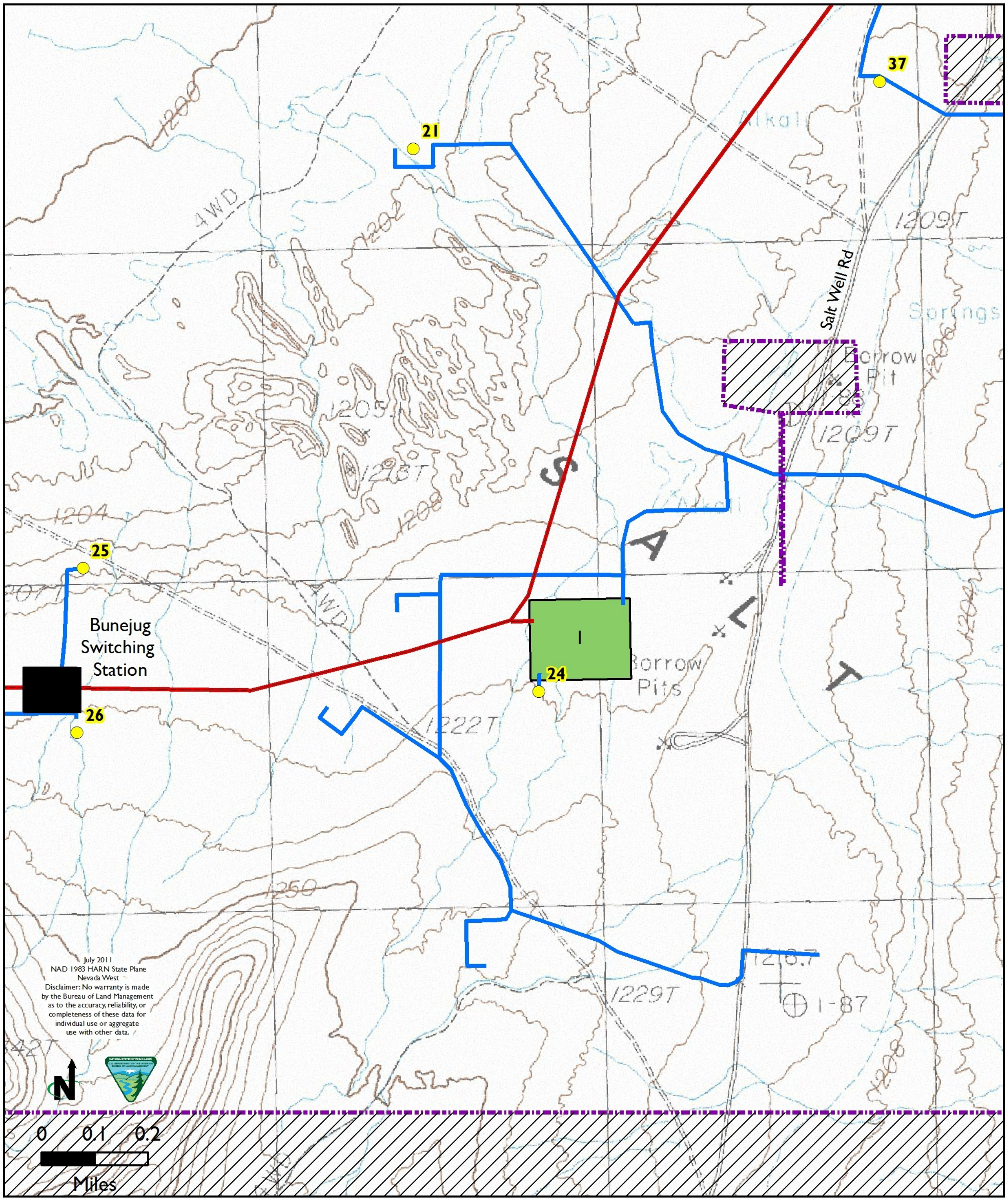
With an estimate of 2,500 gpm for maximum evaporation loss per 30-MW facility, each water well would have a minimum production rate of 500 gpm; therefore, five wells would be required at a time of maximum evaporation loss and minimum water well production per 30-MW facility. Each water well would require a 50-foot radius of disturbance around each water well head (0.2 acre) and one mile of 20-foot-wide corridor for road and pipe (2.5 acres) per well for a total of 3 acres of disturbance per water well. For maximum buildout, four 30-MW power plants would require up to 20 wells and approximately 60 acres of disturbance. Preferably, water wells would be within a one-mile radius of their respective power plant site, and, to the extent feasible, the pipelines would be included within the geothermal fluid pipeline corridors and/or the interconnection line corridor. However, the known source, Well 58-9, could be used for any of the power plant sites, and the pipeline would be included within



Land Status of Vulcan Project Area
Churchill County, Nevada
Vulcan Facilities
Vulcan Project Area Boundary
Proposed Well Pad
Proposed Steamfield Pipeline and Associated Road
Proposed 230 kV Interconnection Line
Proposed Power Plant and Substation
Alternative 230 kV Interconnection Line Corridor
Other Features
Proposed Switching Station
CLP Title Transfer
Existing Power Plant
Existing 230 kV Transmission Line
Existing Conservation Easement
Approved, Pending Conservation Easement
Proposed Conservation Easement
Open Water
Excluded from Lease Area
Land Ownership
Bureau of Land Management
Bureau of Reclamation
Fish and Wildlife Service
Private Land (Including city and county lands)
Source: BLM 2010, Churchill County 2010, USFWS 2011, US Navy 2011a, Vulcan 2010
0 0.5 1
Miles
Carson Lake
Vulcan Proposed Bunejug Switching Station
Salt Wells Rd
Existing ENEL Geothermal Power Plant
Existing SPPC 230 kV Transmission Line
SPPC Proposed or Vulcan Alternative Bass Flat Switching Station
Existing Fort Churchill to Austin 230 kV Transmission Line
50

Figure 2-10

This page intentionally left blank.

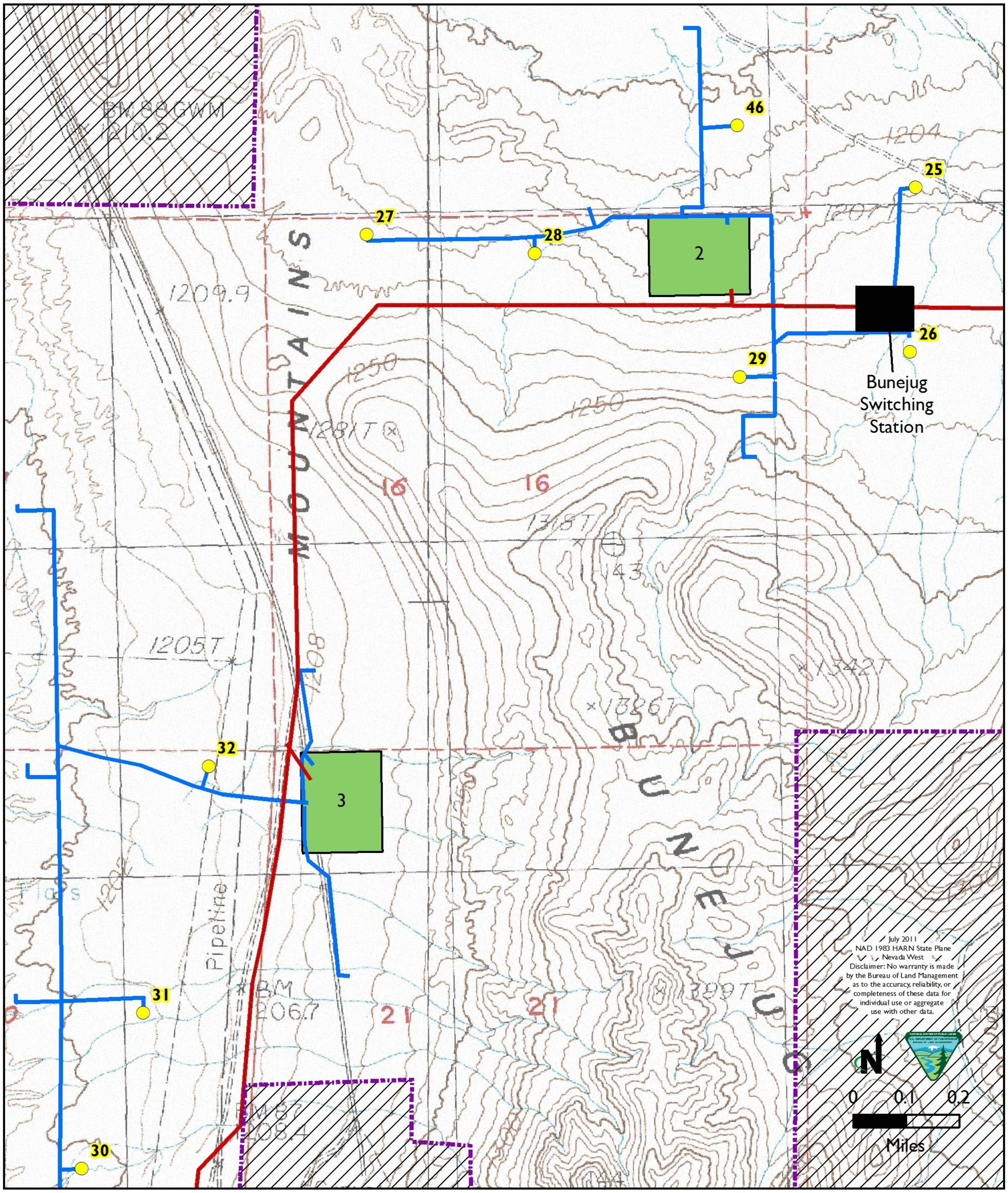


Vulcan Project Area Boundary
Proposed Well Pad
Proposed Steamfield Pipeline and Associated Road
Proposed 230 kV Interconnection Line
Proposed Power Plant and Substation
Proposed Switching Station
Excluded from Lease Area

Vulcan Proposed Power Plant and Substation 1

Churchill County, Nevada

Figure 2-11



Vulcan Project Area Boundary

Proposed Well Pad

Proposed Steamfield Pipeline and Associated Road

Proposed 230 kV Interconnection Line

Proposed Power Plant and Substation

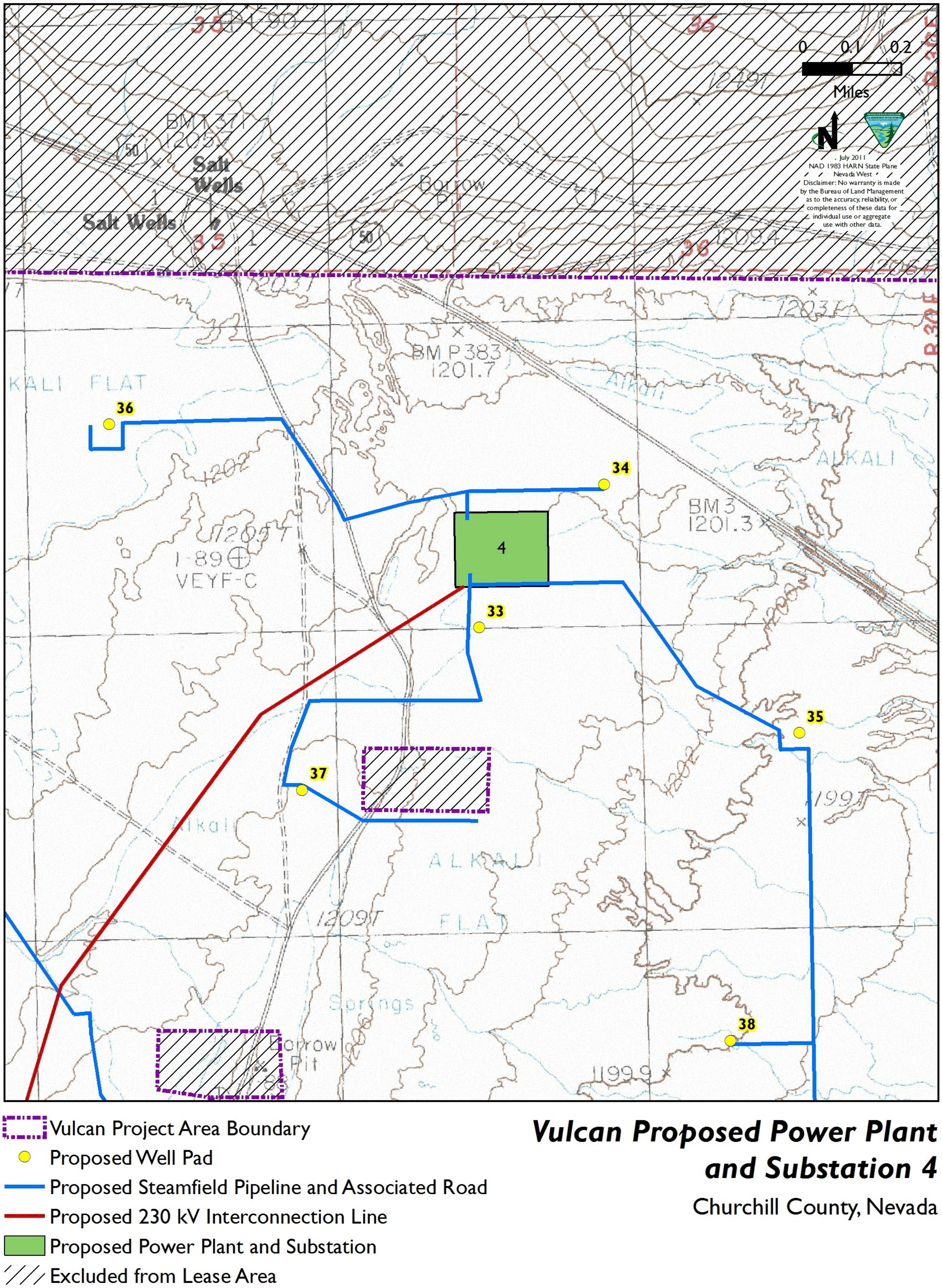
Proposed Switching Station

Excluded from Lease Area

Vulcan Proposed Power Plants and Substations 2 and 3

Churchill County, Nevada

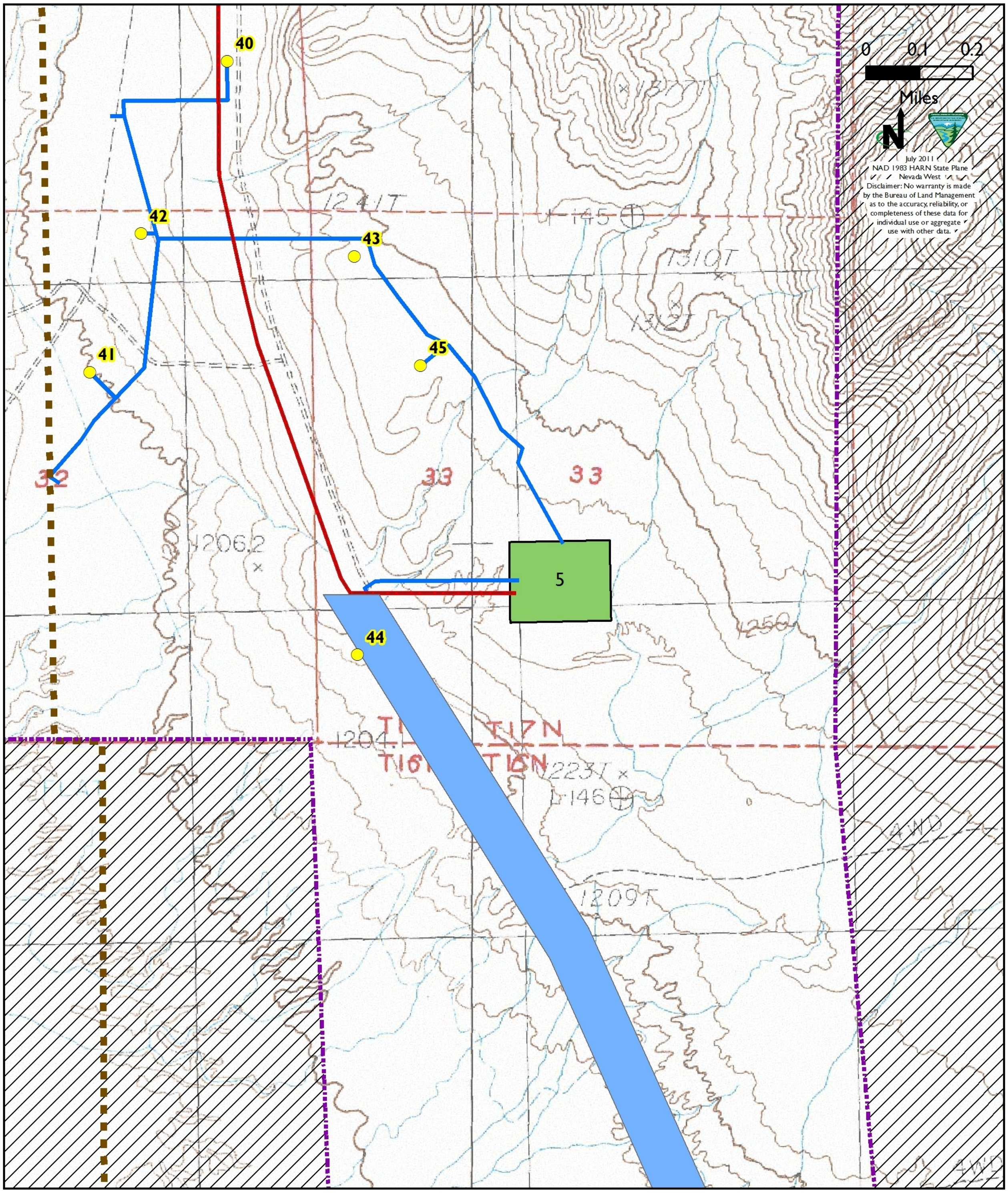
Figure 2-12



Vulcan Proposed Power Plant and Substation 4

Churchill County, Nevada

Figure 2-13



- Vulcan Project Area Boundary
- Proposed Well Pad
- Proposed Steamfield Pipeline and Associated Road
- Proposed 230 kV Interconnection Line
- Proposed Power Plant and Substation
- Alternative 230 kV Interconnection Line Corridor
- CLP Title Transfer
- Excluded from Lease Area

Vulcan Proposed Power Plant and Substation 5

Churchill County, Nevada

Figure 2-14

the geothermal fluid pipeline corridors and/or the interconnection line corridor, thereby minimizing the ultimate disturbance. Vulcan would finalize the POU/POD prior to construction of their power facilities. Appropriate procedures and mitigation measures outlined in this EIS would be included in the POU/POD.

The fire/service water storage tank would be arranged to provide dedicated water to the fire protection system and sufficient storage for use as plant service and non-potable domestic water (NFPA 2008). The tank capacity at each site would be approximately 300,000 gallons and would be erected early in the construction phase. The initial fill source of water and fire make-up water during operations is anticipated to be the groundwater wells.

Communications. Communication facilities would consist of one of the following two options:

- A dedicated land line telephone connection to the project site, with DSL service if available. A fiber optic connection would be installed via the optical ground wire between the power plant substation(s) and the proposed Bunejug Switching Station where the line would terminate for the supervisory control and data acquisition (SCADA) system, control, protective relaying, and communications with SPPC. Restricted-access SCADA data on system performance would be streamed to the Project Control Center at one of the proposed power plants for monitoring. The communication channels and network setup for the project would be coordinated with SPPC and would adhere to the cyber security requirements of the North American Electric Reliability Company (NAERC).
- In order to handle communications (command, control, voice, and internet) at 18 GHz Ethernet/T-1 speeds, Vulcan would arrange to have installed an approximately 100-foot-tall microwave tower at each of the power plant sites that would communicate with a tower at a provider location.

Proposed Flash Power Plant. Vulcan proposes to utilize Power Plant Sites 3 and 5 (Figure 2-9) for a potential flash power plant facility where higher resource temperatures are anticipated. Geothermal flash technology is generally more cost effective and efficient than binary technology but typically requires geothermal resources with temperatures that exceed 360 degrees Fahrenheit (°F).

Power Plant Construction. A 23.5-acre site would be large enough to accommodate a construction laydown area and all the necessary facilities for the flash power plant, including the turbine and control building, mechanical draft cooling towers, a non-condensable gas removal system, a fire water storage tank, a potable water storage tank (if needed), a rock muffler, a brine holding pond, communication microwave tower, and an electrical substation (refer to **Appendix A**, Typical Geothermal Resource Development and Transmission Tools). Construction methods would be similar to those proposed under the Ormat Proposed Action and can be found under the pertinent section.

Plant Operation. Vulcan proposes to utilize two 35-MW (gross) turbine-generator sets at the flash power plant location. The turbine-generator sets would be supplied with all the necessary auxiliaries for control, lube oil, and cooling. The turbine building would also house the condenser, hot well pumps, control room, and data acquisition and control system, as well as personal hygiene facilities for employees. The motor control and switchgear would be housed in individual self-contained, weatherproof modules, which would be just outside the turbine-generator building. The layout of the power plant equipment would allow for a future hydrogen sulfide (H_2S) abatement system if it should become necessary, without extensive removal of piping, equipment, or supports.

Based on preliminary data from Salt Wells and data available from other Nevada projects, Vulcan anticipates that the noncondensable gas content at Salt Wells should be no greater than 500 parts per million of the brine flow. At the cooling tower, the exiting air and vapor would disperse the noncondensable gas, which would minimize collection of the gases within the power plant area, including H_2S, and thereby reduce human exposure.

Vulcan does not expect to need an H_2S abatement system for the power plants at Salt Wells. However, the facility would be designed so that a system could be added should the noncondensable gas content or environmental regulations change.

Water Requirements. The cooling water system would consist primarily of the cooling tower, pumps, and condenser. For the flash power plant, approximately 2,250 gpm of condensate would be needed for each 30-MW (net) unit. On a hot, dry summer day, approximately 2,000 gpm would be lost to evaporation. During the night time hours of the summer and winter, the evaporation loss would be significantly less. The average annual evaporation is expected to be approximately 1,700 gpm for each 30-MW (net) power plant or less than 5,500 ac-ft per year for a 60-MW flash power plant facility (**Table 2-5**).

Communications. Proposed communications would be the same as identified under the Binary Power Plant description.

Substations

Each of the geothermal power plants would include an electrical substation on a footprint of approximately 300 by 200 feet. Surrounding the substation would be an 8-foot-tall chain-link fence with vehicle and personnel access gates. The surface of the substation would consist of crushed rock and would be bermed for spill containment.

The substation equipment would be installed on concrete foundations. The electrical generators would be connected to the substation via a 13.8-kV line.

Bunejug Switching Station

Vulcan proposes a switching station called the Bunejug Switching Station to interconnect the proposed Vulcan geothermal power plant(s) to the SPPC 230-kV transmission line proposed under the Fallon 230-kV Source Project. The Bunejug Switching Station would involve the construction of a four-breaker switching station on an approximate 500-foot by 500-foot parcel; the switching station itself would be approximately 310 feet by 310 feet. The south and north breakers, at the Bunejug Switching Station, would allow for the connection of the proposed SPPC 230-kV transmission line. The west breaker would allow for connection of the Vulcan 230-kV interconnection transmission line originating at Vulcan's Power Plant Sites 2, 3, and 5 to the west of the switching station and the east breaker would allow for interconnection tie to the Vulcan power plants (Sites 1 and 4) to the east side of the switching station. The 230-kV interconnection transmission line between Vulcan's power plants and the Bunejug Switching Station is discussed in the next section.

Construction methods would be the same as identified under the proposed SPPC Bass Flat Switching Station.

Interconnection Transmission Lines

To connect the Vulcan power plants to the Bunejug Switching Station, Vulcan proposes a 230-kV interconnection transmission power line. The transmission interconnection line and construction methods are similar to the 230-kV transmission line proposed by SPPC. Vulcan's interconnection line would run from, and between, Vulcan's power plants to the Bunejug Switching Station via a single 230-kV circuit transmission line. In addition, Vulcan would construct a transmission line from the Bunejug Switching station the SPPC 230-kV transmission line, which would run adjacent to the Bunejug site. Each structure would carry a single overhead ground wire/fiber optic cable for lightning protection and fiber-optic communications. A steel dead-end structure measuring 30 feet wide by 45 feet tall would provide a termination point for the overhead Vulcan 230-kV interconnection line.

Proposed staging areas, which would be up to approximately five acres, and other associated construction needs, would be identified and provided for in a POD as previously discussed under the SPPC Proposed Action.

Pipelines

Pipelines would be constructed as identified under the Ormat Proposed Action, described previously.

Well Pads

Vulcan has obtained approval from BLM for exploratory drilling and well pad construction at 20 well pad locations, 11 of which have already been constructed (EA-NV-030-07-05 and DOI-BLM-NV-C010-2009-0006-EA). Vulcan proposes to construct 26 new well pads. The proposed well pads would be 400 feet by 450 feet (4.2 acres) and would be covered with compacted gravel and sloped downward to a 200-foot by 60-foot reserve pit located within the footprint of the well pad. The 11 existing well pads may be used as laydown areas while constructing the proposed well pads. The reserve pits would be unlined because the naturally occurring clay content in the drilling muds that flow into the reserve pit would seal the pit, preventing drilling fluids and other liquid run-off from percolating into local groundwater. Each well pad would have a berm around its perimeter and secondary containment would be provided around the fuel tank. During drilling operations, ditches that drain to the reserve pit would be provided. The well pads would be oriented so that excavation operations could be minimized. **Table 2-6**, Proposed Well Pad Sites, describes each well pad site. . Directional drilling is not feasible for the project and is not part of the proposed action or alternatives.

Wells

Binary Power Plant Support. All wells would be constructed using the same methods as identified under the previously described Ormat Proposed Action.

Production Wells and Injection Wells. At a 360°F geothermal resource temperature, each 30-MW (net) binary project would need approximately 18,000 gpm of geothermal resource water, which would require up to eight production wells and four injection wells. The injection wells would be strategically placed to support the reservoir pressure and to ensure that the fluids are not directly reproduced. Injection wells may be located on a dedicated injection pad or may be located on the same pad as the production wells but drilled to a different depth.

Water Wells. To supply water during construction and operation, several groundwater wells would be drilled (see Table 2-5). Estimated consumptive use is detailed in the Power Plant Water Requirements section.

Flash Power Plant Support. Wells would be constructed similarly to wells used for a binary power plant as identified under the Ormat proposal.

Production Wells and Injection Wells. At 360 ° F, the proposed flash configuration would need an estimated 11,120,000 pounds per hour of fluid to generate 60 MW (net), requiring up to 14 production wells and 7 injection wells (21 wells per 60-MW facility). Production wells for a flash project are typically deep wells, and with directional drilling more flash production wells can be located on the same pad. Vulcan anticipates drilling three to five wells on each 450-foot by 400-foot pad. Thus, each 60-MW flash power plant would require a minimum of five pads for production and injection wells. The injection wells would be strategically placed to support the reservoir pressure and to ensure that the fluids are not directly reproduced. Injection wells may be located on a dedicated injection pad or may be located on the same pad as the production wells but

Table 2-6
Proposed Well Pad Sites

Well Pad No.	Kettlemen Number	Lease Number	Township/ Range	Section
21	72-10	N-79666	17N30E	10
22	31-13	N-79665	17N30E	13
23	65-13	N-79665	17N30E	13
24	12-14	N-79665	17N30E	14
25	87-9	N-79666	17N30E	9
26	28-10	N-79666	17N30E	10
27	23-15	N-79310	17N30E	15
28	21-16	N-79665	17N30E	16
29	51-16	N-79665	17N30E	16
30	83-16	N-79665	17N30E	16
31	67-20	N-79663	17N30E	20
32	75-20	N-79663	17N30E	20
33	81-20	N-79663	17N30E	20
34	16-1	N-79668	17N30E	1
35	34-1	N-79668	17N30E	1
36	68-1	N-79668	17N30E	1
37	33-2	N-79668	17N30E	2
38	61-11	N-79666	17N30E	11
39	55-12	N-79666	17N30E	12
40	77-12	N-79666	17N30E	12
41	86-29	N-79663	17N30E	29
42	63-32	N-79664	17N30E	32
43	71-32	N-79664	17N30E	32
44	11-33	N-79664	17N30E	33
45	17-33	N-79664	17N30E	33
46	23-33	N-79664	17N30E	33

drilled to a different depth. When injection wells are on the same well pad as production wells, the injection well depth would be significantly different. Therefore, to maximize and protect the resource, eight or nine well pads may be developed. Should the actual resource temperature be higher, the amount of wells needed to generate 60 MW would be less.

A typical production wellhead assembly would consist of two shut-in valves, a removable gooseneck section, and instrumentation. High temperature wells for a flash power plant generally do not require pumping.

The injection wells are generally the same for a flash power plant as a binary power plant. However, injection pumps would be required at the power plant in order to transport the brine to the well field and supply the required pressure for injection into the reservoir.

Water Wells. Water wells would be constructed and operated as identified under the binary power plant proposal.

Access Roads

Vulcan would access the project area from the Macari and Salt Wells Road turnoffs from Highway 50. New access roads would be developed off the existing roads in the project area. Vulcan would maintain the access roads as provided for in the POU.

Access roads would be constructed with methods similar to those identified under the Ormat Proposed Action and can be found under the pertinent section.

Material for Construction Fill and Base

During previous well pad construction, Vulcan found that suitable fill materials exist on site and presumes that the need for additional rock would be unlikely; this would be determined on a case-by-case basis.

If additional base rock or other earth materials are needed for road building or power plant construction, they would be obtained locally from the sites themselves; from the on-site borrow pit east of the Bunejug Mountains in Section 14, Township 17 North, Range 30 East; from the on-site commercial quarry (Glacier Construction) west of the Bunejug Mountains in Section 21, Township 17 North, Range 30 East; or from other local commercial sources such as Mackadon Cement or A&K Earthmovers. Vulcan has obtained BLM Mineral Material Contract N-83072 to purchase up to 40,000 cubic yards of borrow materials from the borrow pit east of the Bunejug Mountains.

Construction Water

Vulcan would need water for dust control and soil compaction during construction of the power plant sites, well field facilities, and interconnection lines. Water for construction would be obtained from a combination of the following three sources:

- On-site water well(s): As stated, Vulcan may apply to the NDWR and the NDEP for approval to drill one or more additional wells for dust control and compaction during construction of the power plant sites and related facilities.

- Water purchased from irrigation district: Vulcan has also purchased water from the TCID. The TCID has been an important source of water during drilling.
- Water purchased from private parties: Vulcan has identified numerous private parties in Fallon who have potable and non-potable water available for sale.

Vulcan would obtain concrete from an off-site batch plant with its own water supply and would supply water for construction workers from off-site sources as well. During the early phase of construction at the power plant sites, it is anticipated that Vulcan would water the disturbed areas up to three times daily.

Workforce

Binary Power Plants. Vulcan may use two or three drilling crews at a time to complete drilling of the proposed production and injection wells needed for the 120 MW of proposed development. Each drilling crew would have approximately six workers, and drilling is expected to continue to the completion of power plant construction. Well pads typically require a crew of six workers for their construction.

Workforce estimates for the binary power plants include up to 122 workers during the construction of each 30-MW (net) power plant and associated well field and interconnection facilities. If two 30-MW (net) power plants are constructed two months apart, up to 244 workers would be needed. Once both 30-MW power plants are installed, the power plants and well field operations would have a combined estimated 33 employees. This staffing plan assumes six power plant operators for the first 30-MW binary power plant and four for the second 30-MW binary power plant.

Flash Plant. Vulcan estimates that it would need up to 130 workers during the construction of the 60-MW (net) flash power plant and associated well field and interconnection facilities. Once the 60-MW power plant is installed, the power plant and well field operations would have an estimated 26 employees.

The 60-MW flash power plant construction is expected to take 12 to 15 months. Construction of the 60-MW (net) flash well field pipelines requires the same estimated work force as identified under the binary power plant development. The staffing plan assumes five power plant operators for the first power plant. Complete 24-hour coverage 7 days per week requires 168 hours, divided into 40-hour shifts, resulting in 4.2 shifts per week. Factoring in sick time and vacation, five power plant shift operators could handle power plant operations.

Vulcan may use two or three drilling crews to complete drilling of the 24 production and injection wells needed for the first 60-MW phase of development. Each drilling crew would have approximately six workers, and drilling is expected to continue to the completion of power plant construction. If additional well pads are needed, a crew of six workers would be needed to construct each proposed well pad.

Decommissioning and Reclamation

At the end of the project lifespan, the power plant and all related facilities would be decommissioned and the project site would be restored to its pre-project condition. As part of the Proposed Action, Vulcan will provide proof of bonding prior to any surface disturbing activities in accordance with 43 CFR 3200 (see Appendix A).

Vulcan Power Company - No Action

Under the No Action Alternative, the geothermal power plants and associated facilities would not be constructed. The No Action Alternative would not facilitate geothermal development or meet the stated purpose and need. The No Action Alternative is carried forward, however, for detailed analysis in accordance with CEQ guidance to provide a benchmark against which impacts from the action Alternatives can be evaluated (40 CFR 1502.11[d]).

2.3 ALTERNATIVES

Sierra Pacific Power Company – Fallon 230-kV Source Project

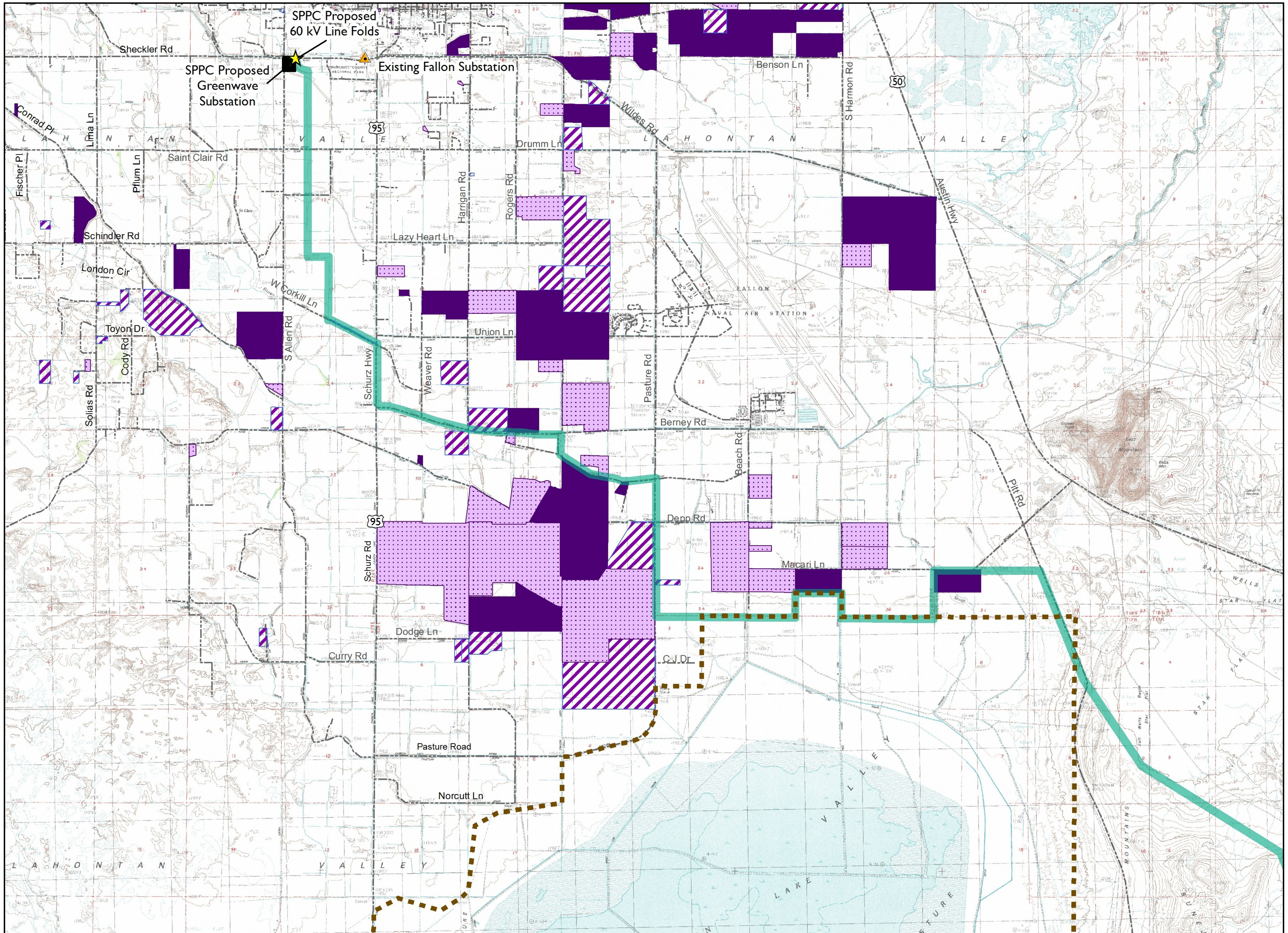
Alternative 1

From the Macari Switching Station, Alternative 1 would travel south of the Proposed Action route, following the Carson Lake and Pasture Title Transfer boundary from east to west, then running north of the Corkill Ranch on Cushman Road (**Figure 2-15**, Sierra Pacific Power Company Alternative 1). This Alternative was proposed to minimize the impact on existing conservation easements that are either bisected or bordered by the Proposed Action. Deeds to the conservation easements include an 80-foot height restriction and restrict uses to those that support agriculture.

- Length of Alternative 1 Transmission line: 22.4 miles (118,272 feet)
- Total Temporary Disturbance under Alternative 1: 838 acres
- Total Permanent Disturbance under Alternative 1: 362 acres

Alternative 2

The route would be the same as the Proposed Action except the initial portion from the Macari Switching Station would continue west along Macari Lane for an additional 2 miles before going south for one half mile along Schaeffer Lane and connecting back into the Proposed Action route (**Figure 2-16**, Sierra Pacific Power Company Alternative 2). This Alternative was developed to address concerns about bisecting land parcels south of Macari Lane.



Sierra Pacific Power Company Alternative 1

Churchill County, Nevada

SPPC Facilities

- Alternative 1 230 kV Transmission Line Corridor
- Proposed 60 kV Line Folds

Other Features

- Proposed Substation
- Existing Substation
- CLP Title Transfer
- Existing Conservation Easement
- Approved, Pending Conservation Easement
- Proposed Conservation Easement

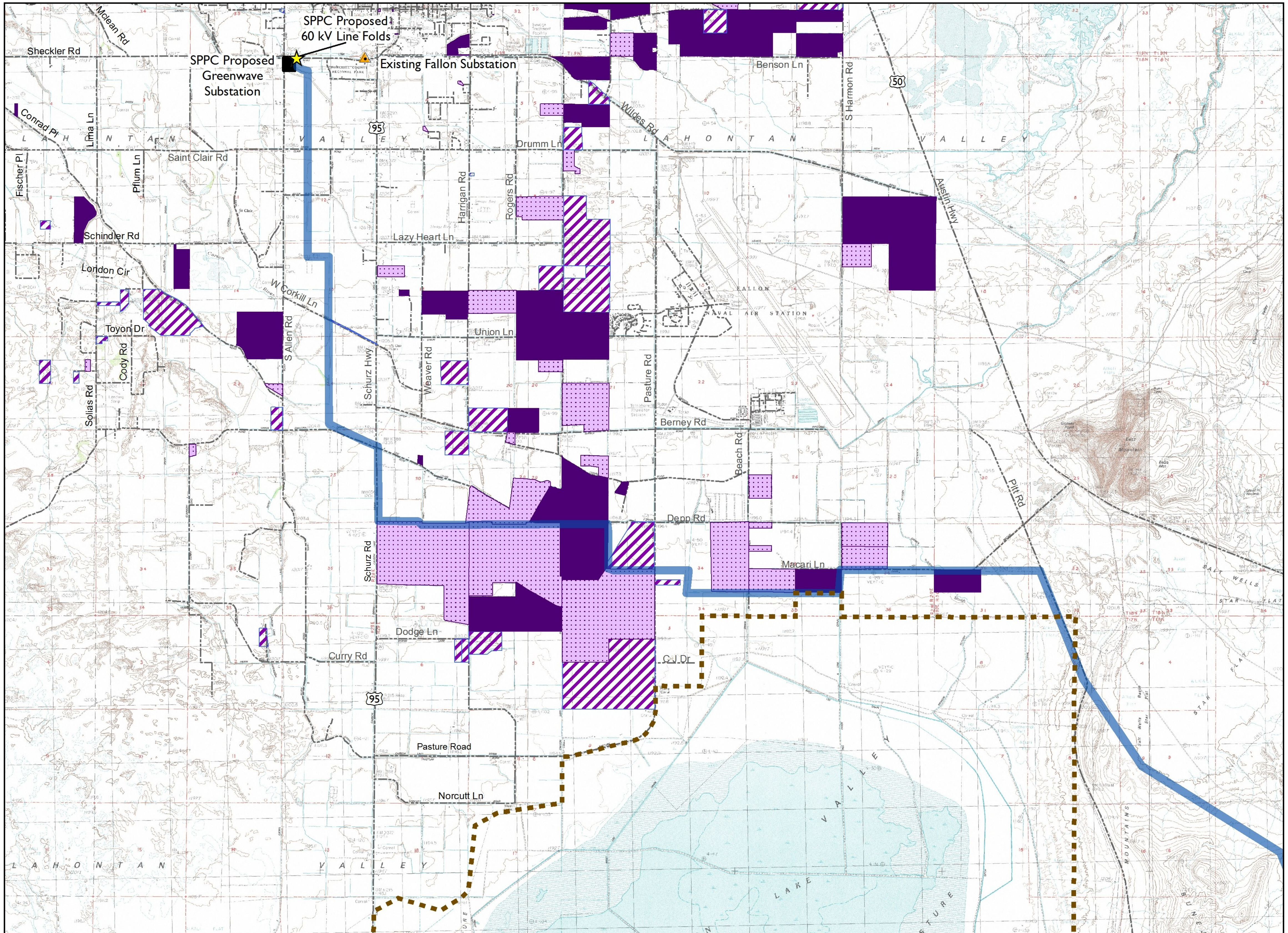
Source: BLM 2010, Churchill County 2010, SPPC 2010, US Navy 2011a

0 0.5 1
Miles

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-15

This page intentionally left blank.



Sierra Pacific Power Company Alternative 2

Churchill County, Nevada

SPPC Facilities

- Alternative 2 230 kV Transmission Line Corridor
- Proposed 60 kV Line Folds

Other Features

- Proposed Substation
- Existing Substation
- CLP Title Transfer
- Existing Conservation Easement
- Approved, Pending Conservation Easement
- Proposed Conservation Easement

Source: BLM 2010, Churchill County 2010, SPPC 2010, US Navy 2011a

0 0.5 1
Miles

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-16

This page intentionally left blank

- Length of Alternative 2 Transmission line: 21.7 miles (114,576 feet)
- Total Temporary Disturbance under Alternative 2: 789 acres
- Total Permanent Disturbance under Alternative 2: 329 acres

Alternative 3 (Preferred)

The route would the same as Alternative 2 except one half mile west of pasture road the route would jog south then head west one half mile along the southern boundary of the Corkill Ranch conservation easement before going north one half mile along the Carson Lake Drain and the western boundary of the conservation easement before connecting back into the Proposed Action/Alternative 2 route (**Figure 2-17**, Sierra Pacific Power Company Alternative 3 (Preferred). This alternative was developed to address concerns about bisecting the Corkill Ranch conservation easement. This alternative would also include an option to include the Macari Fiber Optic Alternative for a backup fiber optic communication connection.

- Length of Alternative 3 Transmission line: 21.9 miles (115,632 feet)
- Total Temporary Disturbance under Alternative 3: 796 acres
- Total Permanent Disturbance under Alternative 3: 332 acres

Macari Fiber Optic Alternative

Under this Alternative, SPPC would construct an additional fiber optic line to connect communications from the Highway 50 (**Figure 2-18**, Sierra Pacific Power Company Macari Fiber Optic Alternative). This alternative could be applied as an option to all alternatives if SPPC is not able to get authorization to complete the transmission line from the Macari Switching Station to the Greenwave Substation. This Alternative from Macari Lane would involve trenching about one mile along Macari Lane to Highway 50. The fiber optic communications cable from the 230-kV transmission line would be routed underground east along Macari Lane via two four-inch PVC conduits. The conduits would pass beneath the Fallon Canal, or over the canal in association with the Ormat-proposed geothermal pipeline crossing, and would continue 1.25 miles to Highway 50. A bore would be performed under Highway 50, and the conduits would then continue approximately 150 feet west and intercept an existing company-owned communication conduit system. The trench would be a maximum of 1-foot wide and 42 inches deep and would use native fill unless required otherwise. Two four-inch PVC conduits would be placed in the trench with a minimum of 36 inches of native cover. Along with the two four-inch conduits, four 2-foot by 4-foot by 3-foot deep pull boxes would be constructed. Aboveground marker posts (approximately 3 to 4 feet tall) would be placed at 400-foot intervals; these marker posts would display a company logo depicting buried fiber optic cable.

The conduit path would have cable pulling vaults set at 600-foot intervals and on either side of the canal and highway crossings. Additionally, an existing communications vault 3,500 feet east along Highway 50 would be excavated for splicing.

- Length of Macari Fiber Optic Line: 1.5 miles
- Temporary disturbance width of Macari Fiber Optic Line: 8 feet
- Permanent disturbance width of Macari Fiber Optic Line: 6 feet
- Total Temporary Disturbance under the Macari Fiber Optic Alternative: 63,360 square feet (1.45 acres)
- Total Permanent Disturbance under Macari Fiber Optic Alternative: 47,520 square feet (1.09 acres)

Ormat Technologies

Alternative (Preferred)

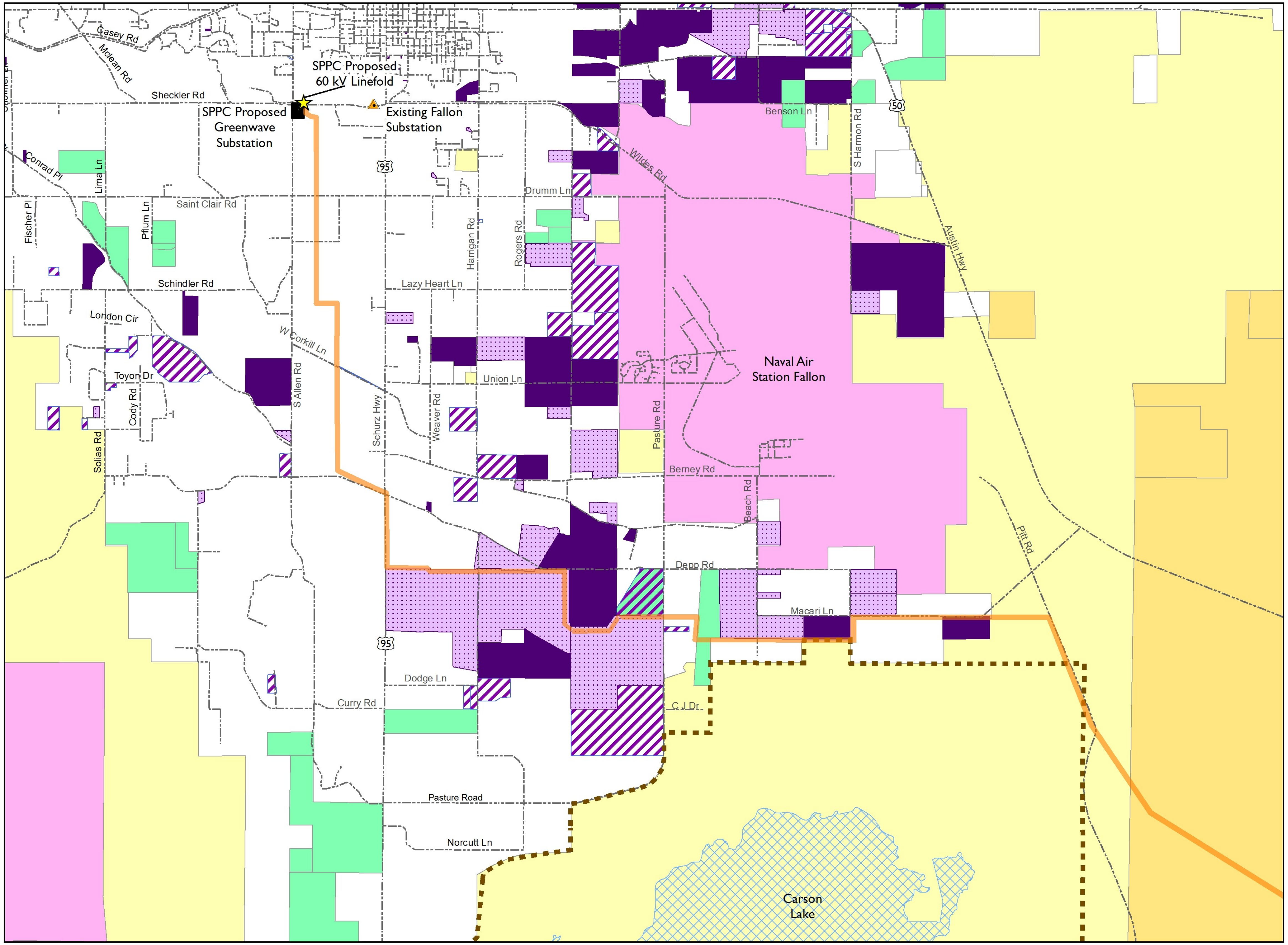
For the Ormat project, the BLM developed an Alternative to relocate Well Sites U and V and that portion of the pipeline running from Well Site T to W (see Figure 2-7) to protect riparian and surface waters within canals. The alternative well pad sites and pipeline locations were selected to be outside of the 650-ft buffer zone for wetland and riparian areas, canals, and Great Basin ecology.

- Alternate Pipeline Length: 6.4 miles
- Temporary Alternate Pipeline Corridor width: 300 feet
- Permanent Alternate Pipeline Corridor width: 155 feet
- Total Area of Temporary Alternate Pipeline Disturbance: 233 acres
- Total Area of Permanent Alternate Pipeline Disturbance: 120 acres
- Total Estimated Temporary Disturbance: 318 acres
- Total Estimated Permanent Disturbance: 195 acres

Vulcan Power Company

Alternative

An Alternative for the Vulcan project, should SPPC elect not to build its project, would be for Vulcan to propose to construct the Bass Flat Switching Station and extend its proposed interconnection 230-kV transmission power line from the Site 5 power plant to their Alternative Bass Flat Switching Station (see Figure 2-9). The Alternative Bass Flat Switching Station would be constructed as previously described under the SPPC Proposed Action and would allow Vulcan to tie into the existing Austin to Fort Churchill 230-kV transmission line (see Figure 2-12). The transmission line from Power Plant Site 5 to the Bass Flat Switching Station would be constructed adjacent to an existing road.



Sierra Pacific Power Company Alternative 3 (Preferred), North

Churchill County, Nevada

SPPC Facilities
- Alternative 3 (Preferred) 230 kV Transmission Line Corridor
- Proposed 60 kV Linefold

Other Features
- Proposed Substation
- Existing Substation
- CLP Title Transfer
- Existing Conservation Easement
- Approved, Pending Conservation Easement
- Proposed Conservation Easement
- Open Water

Land Ownership
- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Fish and Wildlife Service
- Private Land (Including city and county lands)

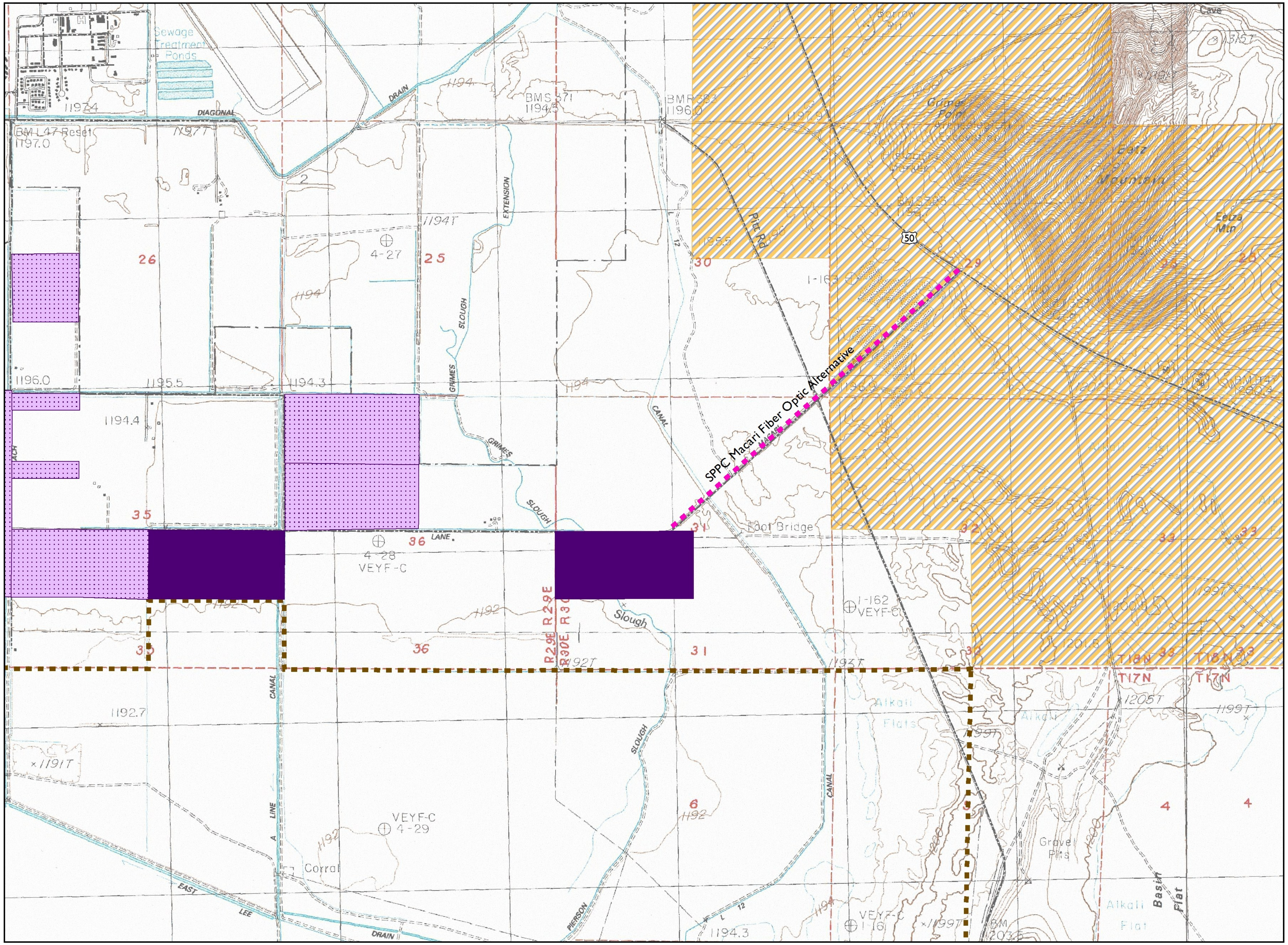
Source: BLM 2010, Churchill County 2010, SPPC 2010, USFWS 2011, US Navy 2011a, US Navy 2011b

0 0.5 1
Miles

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-17

This page intentionally left blank



Sierra Pacific Power Company Macari Fiber Optic Alternative

Churchill County, Nevada

SPPC Facilities

Macari Fiber Optic Alternative

Other Features

CLP Title Transfer

Existing Conservation Easement

Proposed Conservation Easement

No Surface Occupancy

Souce: BLM 2010, Churchill County 2010, SPPC 2010, US Navy 2011a

0 0.25 0.5

Miles

July 2011
NAD 1983 HARN State Plane Nevada West
Disclaimer: 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.

Figure 2-18

This page intentionally left blank

- Transmission line corridor from Power Plant Site 5 to Bass Flat: 4.6 miles (24,288 feet)
- Temporary corridor disturbance width: 300 feet
- Permanent corridor disturbance width: 125 feet
- Bass Flat Switching Station: 5.75 acres
- Alternative 1 Total Temporary Disturbance: 1,427 acres
- Alternative 1 Total Permanent Disturbance: 826 acres

2.4 PREFERRED ALTERNATIVES

On January 28, 2011, the BLM published in the Federal Register a Notice of Availability for the DEIS for the Salt Wells Energy Projects and initiated a 60 day public comment period (76 FR 5198). A public meeting on the DEIS was held in Fallon, Nevada, on March 3, 2011. Thirty comment letters were received and taken into consideration in the preparation of the Final EIS. The majority of comments requested clarification or additional analysis of specific resources. Public comments also identified potential conflicts with the SPPC proposed action and a conservation easement. In a cooperating agency and BLM meeting on April 14, 2011, issues relating to impacts to residences, conservation easements, wildlife, wetlands and land uses were considered and a preferred alternative was developed for all three projects (See **Figure 2-19**, Preferred Alternatives).

As part of the ROD, the proponents will be held responsible for submitting required plans that outline specific engineering and environmental measures for the Preferred Alternatives. **Table 2-7**, Required Project Plans, lists the plans, timeframes for completion and the agencies that oversee or approve each plan.

Sierra Pacific Power Company – Fallon 230-kV Source Project

At the April 14th cooperating agency meeting a newly preferred alternative was developed through a collaborative process that modified SPPC Alternative 2 by rerouting about two miles of the transmission line. This third alternative was added to the Final EIS with additional analysis.

The route would be the same as Alternative 2 except one half mile west of pasture road the route would turn south then head west one half mile along the southern boundary of the Corkill Ranch conservation easement. The route would then travel north one half mile along the Carson Lake Drain and the western boundary of the conservation easement before connecting back into the Proposed Action/Alternative 2 route. This alternative was developed to address concerns about bisecting the Corkill Ranch conservation easement. This alternative would also include an option to include the Macari Fiber Optic Alternative for a backup fiber optic communication connection.

Table 2-7
Required Project Plans

Plan	Completion Date	Responsible Party	Regulating Party
Plan of Utilization	Prior to ROD	Vulcan, Ormat	BLM
Plan of Development	Prior to ROD	SPPC, and Vulcan for Alternative 1	BLM/BOR
Water Monitoring Plan	Developed as exploration occurs	Vulcan, Ormat	BLM
Avian Protection Plan	Prior to ROD	SPPC, Ormat, and Vulcan	USFWS
Spill Prevention and Response Plan*	Included within the POD/POU	SPPC, Ormat, and Vulcan	BLM/BOR
Weed Management Plan*	Included within the POD/POU	SPPC, Ormat, and Vulcan	BLM/BOR
Fugitive Dust Plan	Prior to Construction	SPPC, Ormat, and Vulcan	Churchill County/NDEP – Bureau of Air Pollution Control
Equipment Emissions Mitigation Plan*	Included within the POD/POU	SPPC, Ormat, and Vulcan	BLM
Stormwater Pollution Prevention Plan	Prior to construction	SPPC, Ormat, Vulcan	NDEP - Nevada Bureau of Water Pollution Control
Interim Reclamation Plan*	Included within the POU	Ormat and Vulcan	BLM
Emergency Response Plan*	Included within the POD/POU	SPPC, Ormat, and Vulcan	BLM
Hydrogen Sulfide Plan*	Included within the POU	Vulcan	BLM
Hazardous Materials Management Plan*	Included within the POD/POU	SPPC, Ormat, and Vulcan	BLM
Waste Management Plan*	Included within the POD/POU	SPPC, Ormat, and Vulcan	BLM

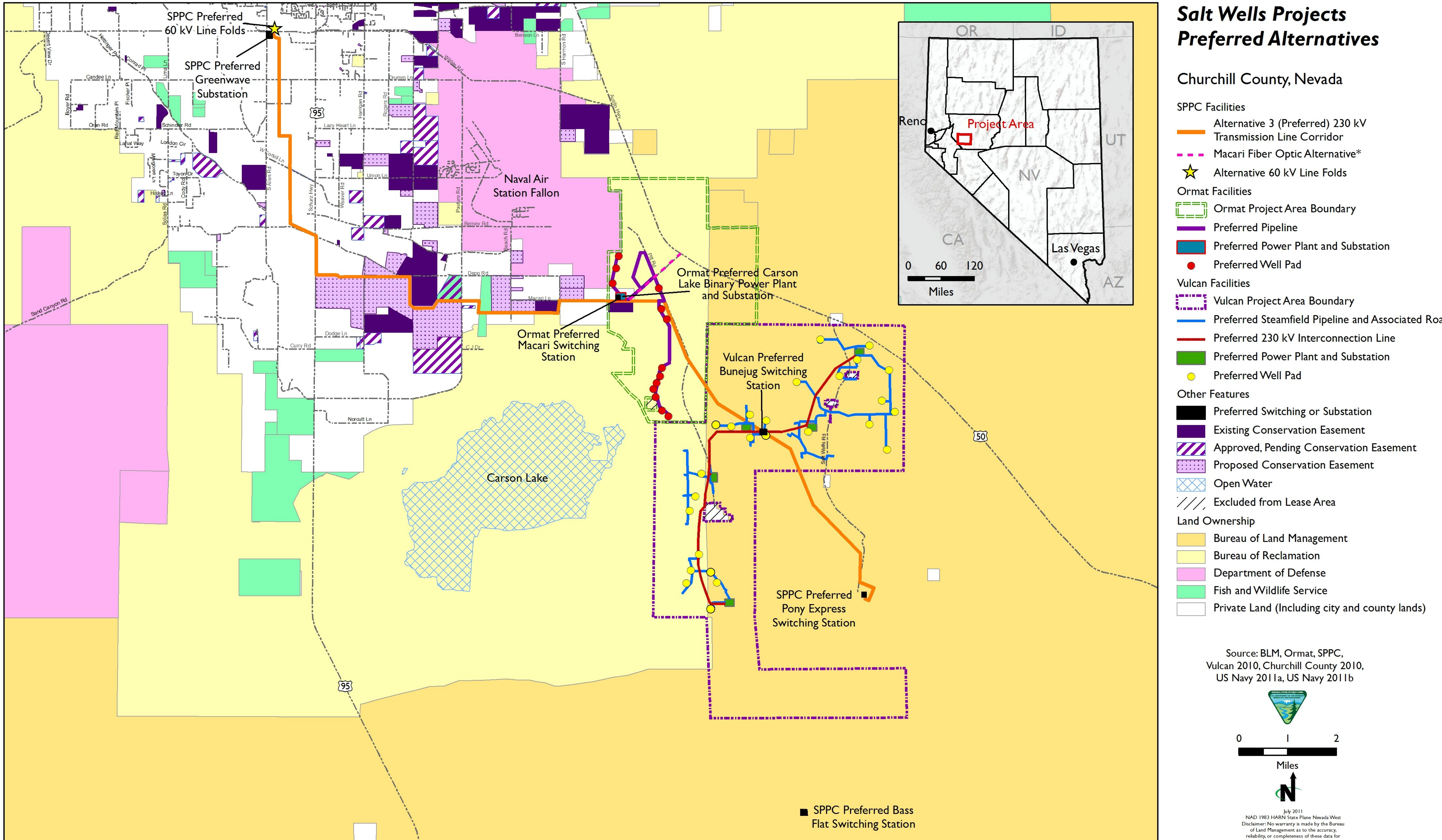
* These plans are included within the Ormat and Vulcan POD/POUs for geothermal operations as an appendix. They are also outlined in the Geothermal PEIS Appendix B. Best Management Practices – Mitigation Measures.

Ormat Technologies – Carson Lake Geothermal Project

Alternative 1 was selected as the Ormat preferred alternative because Alternative 1 has fewer impacts on riparian areas and wetlands than under the Proposed Action while still meeting the purpose and need of the project.

Vulcan Power Company – Salt Wells Geothermal Development Project

The Proposed Action was selected as the preferred alternative based on best meeting the project purpose and need and impacts to adjacent land uses and the environment.



* Option under Alternative 3 (Preferred) if a communication link cannot be permitted between the Macari Switching Station and the Greenwave Substation.

Figure 2-19

This page intentionally left blank

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Sierra Pacific Power Company – Fallon 230-kV Source Project

Alternative transmission line routes and substation locations were assessed in the SPPC *Salt Wells to Fallon 230-kV Project Environmental Constraint Identification, Substation Siting, and Routing Study* (2008), which was submitted with the ROW application to BLM. SPPC based its determination of the proposed route from this study, which indicated it would result in the fewest or smallest scope of environmental impacts. As part of the EIS process, the BLM, cooperating agencies, and SPPC worked to develop Alternative transmission line routes to address issues and concerns identified in scoping and in meetings with the cooperating agencies. Those Alternatives that were carried forward are discussed previously in **Section 2.3**. The following alternatives were considered but eliminated from further consideration.

Allen Road to the Greenwave Substation

An Alternative was considered to extend either the Proposed Action or Alternative 1 routes to Allen Road and then north along Allen Road to the Greenwave Substation. This Alternative was eliminated for the following reasons:

- Ditches and canals run along both sides of North Allen Road, which would force the line to be pushed further from the road and would be much more intrusive to the residents.
- The route would impact approximately 12 to 15 home fronts, as the proposed route along North Allen Road would run close to these homes.
- The existing distribution line along Allen Road is the only power source to this area of Fallon. If the 230-kV transmission line was routed along Allen Road, the existing distribution line would be taken out of service for an undetermined time. This would result in outages of power in the area during construction, requiring that backup or Alternative power be supplied, significantly increasing the construction costs.

Along Highway 50

An Alternative was considered to route the power line from Macari Lane along Highway 50 and across Wildes Road to the existing Fallon Substation. This Alternative was eliminated for the following reasons:

- The route does not meet planning requirement to be within one mile of the existing Fallon 60-kV substation.
- It would result in a negative visual impact on the Grimes Point Archeological Site.
- It would include a portion within the No Surface Occupancy Area.

- It would possibly conflict with Native American concerns.
- Wildes Road is very congested and would be very difficult to locate the line.
- It contained possible safety issues with regard to naval operations.
- It would not provide any future expansion towards Fernley.
- No suitable Greenwave site was identified.
- It would be more expensive due to greater distance and potential underbuild of distribution.

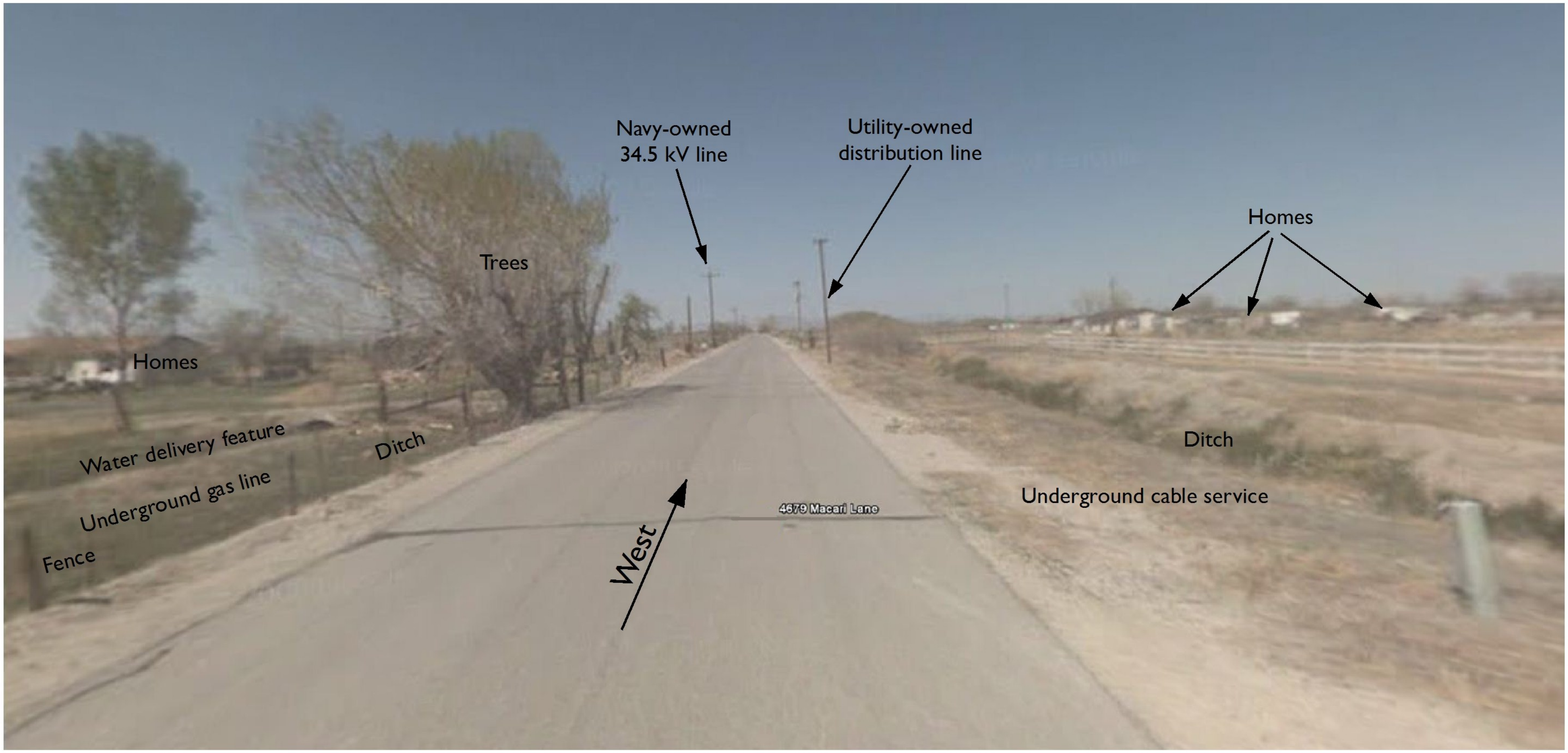
Macari Lane Alternative

An Alternative was considered that would continue the line along Macari Lane and meet up with Proposed Action route at Pasture Road. This Alternative would eliminate the portion of the Proposed Action and Alternative 2 transmission line routes that run along the CLP boundary for one half mile and potentially reduce impacts to birds. This Alternative was eliminated because the portion of Macari Lane west of Beach Road has a number of existing encumbrances including a buried Paiute Pipeline Company natural gas pipeline, a Navy transmission line delivering power to the Navy facilities toward Dixie Valley, an SPPC distribution line, and private water delivery systems. Offsetting horizontally from the gas line and water delivery systems would place the center of the transmission line easement at least 100 feet from the pavement onto private land, which is the same distance the residences are from Macari Lane. Additional complications for siting include the conservation easements, which force the location onto the CLP. A diagram of the area showing the layout of the private land and the exiting encumbrances is included as **Figure 2-20**, Diagram of the Macari Lane at Beach Street.

South of Carson Lake

An Alternative was considered to route the line south of Carson Lake. This Alternative was eliminated for the following reasons:

- Potential impacts on the Pony Express National Historic Trail.
- A second 230-kV transmission line is hard to protect electrically.
- It would result in changes to cost responsibility between utility and geothermal generators, which may jeopardize project feasibility.
- It would be more expensive due to distance (for example, if the line were to circumvent Carson Lake and Pasture in the south to the Greenwave Substation, extra line would still need to be constructed to connect to the geothermal facilities).
- It would be more expensive due to the potential need for underbuilding.



Source: Google Streetview 2011

July 2011
Disclaimer: 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.

Diagram of Macari Lane at Beach Street

Figure 2-20

- It contained unknown impacts due to an entirely new (unstudied) route.

CJ Drive to HWY 95 Alternative

The CJ Drive to HWY 95 Alternative would have been the same as Alternative 1 up until one mile east of Pasture Road, where the route would have turned south to CJ Drive and then continue west to Pasture Road south and around to Highway 95. At Highway 95 the route would go north to Depp Road and then cut across at an angle to the Proposed Action route. This Alternative was proposed to avoid conflicts with the conservation easements and other uses, however it was eliminated for the following reasons:

- It would have greater impacts on resources in the Project Area.
- It would have greater impacts on private landowners.

CJ Drive-West Alternative

This alternative would have followed the same route as the CJ Drive-HWY 95 Alternative except instead of going north on Highway 95 to Depp Road, this route would only extend one and one half miles north on Highway 95 then go west and north to meet up with the Proposed Action route to the Greenwave Substation. This Alternative was proposed to avoid conflicts with the conservation easements and other uses while considering the engineering constraints for routing the transmission line along Highway 95. This alternative was eliminated from further analysis because of the following:

- It would pose engineering challenges for the construction of the transmission line along Highway 95.
- It would have greater impacts on resources in the Project Area.
- It would have greater impacts on private landowners.
- The propose route ran closer to Carson Lake for a longer stretch.

Ormat Technologies – Carson Lake Geothermal Project

Constructing and operating a binary power plant with exclusive air-cooled technology was considered as an Alternative. This Alternative was eliminated due to the fact that using exclusive air-cooled technology would be inefficient and uses more energy and costs more money than would be created from the power plant.

Vulcan Power Company – Salt Wells Geothermal Development Project

Cocoon Switching Station

An Alternative was considered to construct the Cocoon Switching Station approximately 2.25 miles southwest of the existing ENEL Geothermal Power Plant and tie into the station via a 230-kV transmission line from power plant Site 5 by continuing the transmission line south approximately 2.5 miles and then heading west approximately one mile to connect to the Cocoon Switching Station. This Alternative was eliminated due to engineering challenges.

This page intentionally left blank.