CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 Location and Overview

2.1.1 LOCATION

The proposed Carson Lake Geothermal Exploration Project (project) would be conducted by Ormat Nevada, Inc. (Ormat). The project would be mostly located on public lands in Churchill County, Nevada. The geothermal resources under these public lands are currently leased and under contract to Ormat by the Bureau of Land Management (BLM) for geothermal resource development. The proposed project area is approximately seven miles southeast of Fallon, Nevada (Figure 1.1-2).

The project would be located on lands managed by the United States (US) Department of Interior (DOI) Bureau of Reclamation (BOR) and US Department of Defense (DOD). Eight of the proposed well pads are located on BOR managed lands and three of the proposed well pads are located on lands managed by the US Navy at Naval Air Station (NAS) Fallon.

2.1.2 PROJECT OVERVIEW AND OBJECTIVES

Ormat proposes to construct up to 11 well pads and may drill up to three wells per pad for geothermal resource exploration. Ormat would drill temperature gradient wells (TG wells), small diameter exploration wells (slim wells) and full-size exploration wells (exploration wells). The well pad locations are shown in Figure 2.1-1 and are designated Site A through Site K. The township and range, section number, and UTM coordinates for each site are given in Table 2.1-1.

The primary objective of the project is to conduct geothermal exploration and testing activities to determine if the geothermal resource would support commercial power plant development. The project would also help to define the characteristics and potential limits of the geothermal resource within the project area. The following are the major steps that would be required in order to meet the project objective:

- Construct new access roads (approximately 2.5 miles total for all pad sites)
- Upgrade existing access roads
- Construct up to 11 well pads

Table 2.1-1: Well Pad Locations

Site	Kettleman Number	Township/Range	Section Number	UTM Coordinates (NAD 83)	
				Easting (m)	Northing (m)
A	13-30	T 18N / R 30E	30	356367	4362214
B	42-30	T 18N / R 30E	30	357038	4362435
C	55-30	T 18N / R 30E	30	357242	4361792
D	88-30	T 18N / R 30E	31	357793	4361217
E	51-31	T 18N / R 30E	31	357106	4360961
F	44-31	T 18N / R 30E	31	356975	4360394
G	72-36	T 18N / R 29E	36	355939	4360901
H	85-30	T 18N / R 30E	30	357812	4361833
I	84-31	T 18N / R 30E	31	357831	4360279
J	18-19	T 18N / R 30E	19	356454	4362814
K	32-31	T 18N / R 30E	31	356647	4360727

SOURCE: ORMAT 2007

- Drill and complete TG wells, slim wells, and exploration wells
- Flow test exploration wells to determine commercial potential
- Analyze well data

Ormat has identified 11 potential well pad sites; however, it is likely that not all potential sites would be drilled. A drilling sequence is not proposed at this time because subsequent drill sites are solely dependent upon the data found in the active wells. After analysis of well data at the active site, Ormat would determine which site would be drilled next. Ormat may not drill all eleven pad sites; however, they are seeking to obtain permits for all eleven sites at this time so that the wells can be drilled in succession without delays. Eleven sites provide a good range of opportunities to drill into the geothermal resource target areas identified by preliminary geologic and geophysical data gathered for the project area.

This project description is based on Ormat's Plan of Exploration (POE) prepared in August 2007. This project description provides further elaboration of the details of the proposed project.

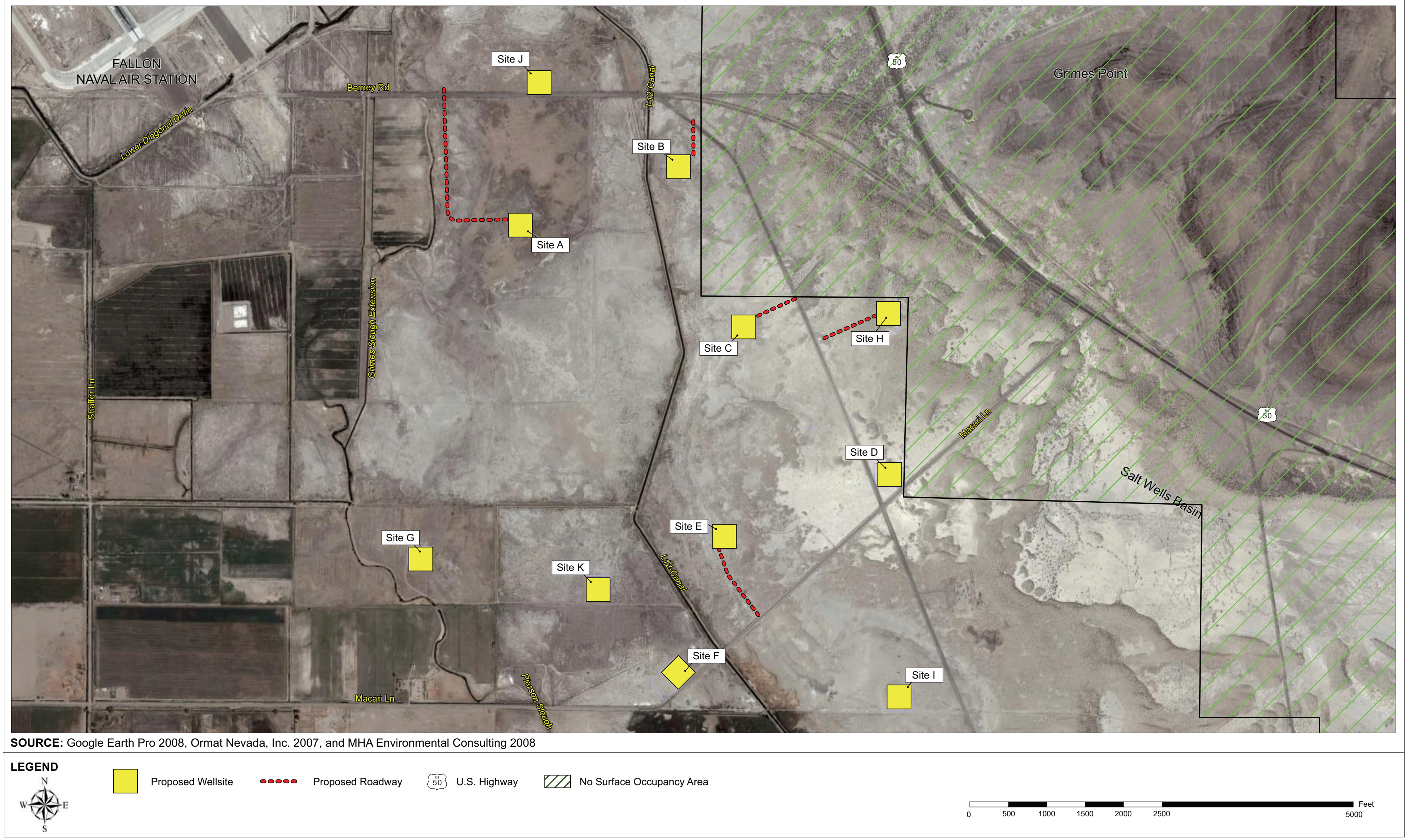
2.2 Project Description

2.2.1 PROPOSED DRILL SITE LOCATIONS

The eleven locations for the proposed well pads were defined based upon results of previous geological and drilling investigations in the area. The proposed well pads have been sited within the areas that are anticipated to be near the most promising temperature gradient and structural features for geothermal development. Gravimetric data was taken in February 2007, which suggests that the hottest part of the resource is under the eastern portion of the BOR managed lands.

The well pad sites were also selected to minimize the amount of surface disturbance. Ormat has selected sites with minimal slope to minimize the amount of cut and fill needed. The well pads were sited adjacent to existing roadways to minimize new surface disturbance for pad access.

Figure 2.1-1: Well Pad Locations and Access Roads



SOURCE: Google Earth Pro 2008, Ormat Nevada, Inc. 2007, and MHA Environmental Consulting 2008

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Cultural resources were avoided to the greatest extent feasible. Each pad would be constructed to include an area of approximately 300 feet by 300 feet and would disturb an area of approximately 90,000 square feet (see Figure 2.2-1) (2.06 acres). Actual dimensions of each drill pad would be modified to best match the specific physical and environmental characteristics of the site area and to minimize grading (cut and fill). Site F is on private property. The site would only be developed with permission from the landowner. Access roads vary in length but would be approximately 15 feet wide. Total ground disturbance per well pad is shown in Table 2.2-1.

2.2.2 Drill Pad and Access Road Construction

Site Preparation

Up to three well pad sites would be developed at a time. The successive well pad sites to be developed would depend upon the testing results of the previously drilled well or wells. The extent of ground disturbance at the well pad site would depend on the type of well to be drilled.

Temperature Gradient Well Pads

A temperature gradient well would be located within the existing designated 300 X 300 foot well pad areas (or the 425 by 275 by 517 foot area available at Site F); however, construction of a 2-acre pad would not be required. No ground vegetation would be cleared and no pad would be constructed. The equipment would be placed around the drill site on the existing land.

Slim Well and Exploration Well Pads

Drill pad preparation for slim well and exploration well drilling activities would include vegetation clearing, earthwork, drainage, and other improvements necessary for efficient and safe operation and fire prevention within a 300 by 300 foot area. Clearing would include removal of organic material, stumps, brush, and slash. Up to approximately 1 foot of depth of soil would be removed at each site to create level pads (for a total of up to 3,300 cubic yards of soil per pad). Most well pad sites are very level and would only require scraping off the scrub brush and then laying gravel.

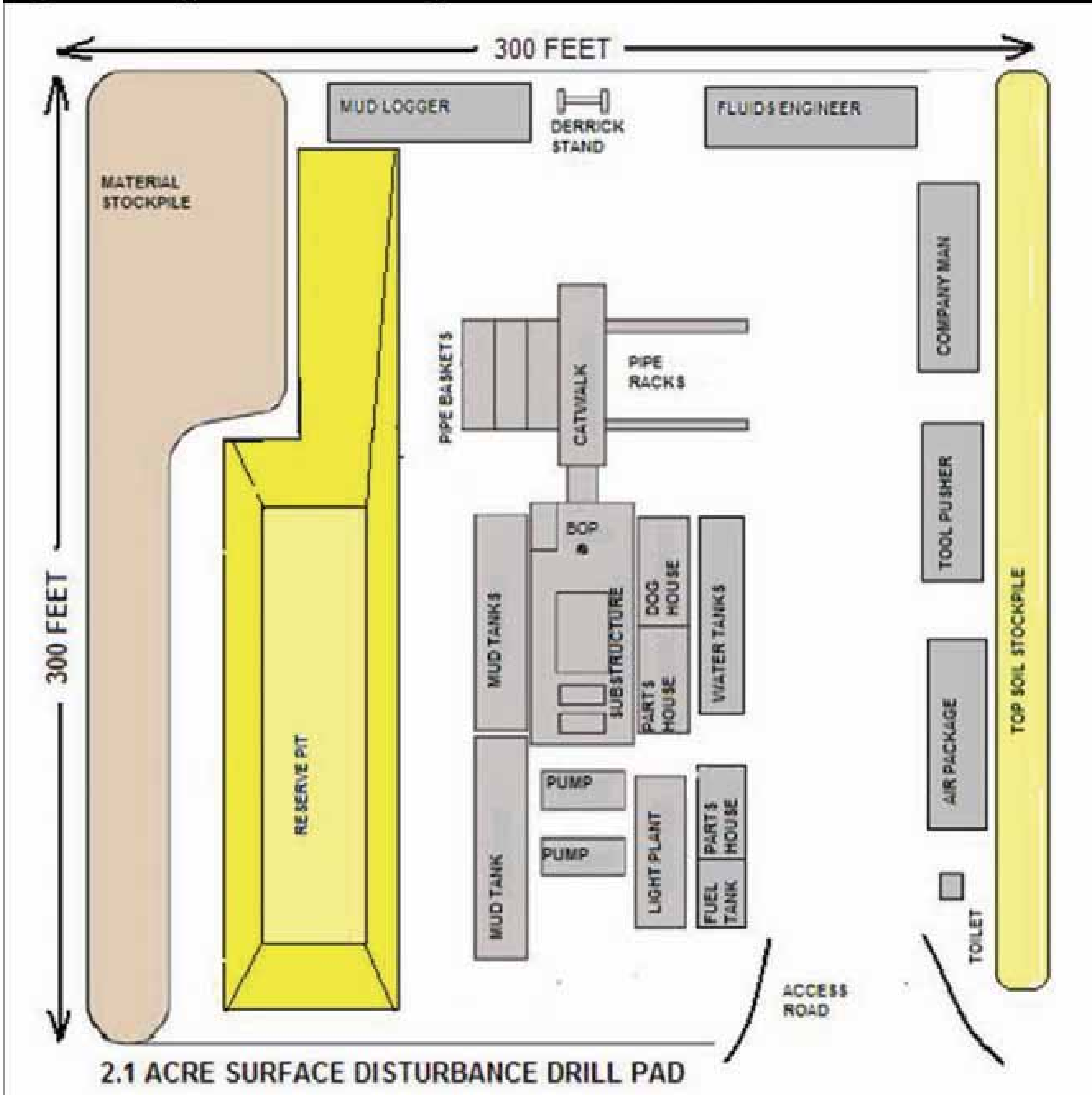
The pads would be graded and compacted. Drill pad construction material would be obtained from the Salt Wells Community Pit or from private sources. The drill pad would be covered with up to 8 inches of gravel. Total aggregate required is estimated at 2,200 cubic yards per pad.

Access Roads

The project area would be accessed from US Highway 50 via Macari Lane and Berney Road. The applicant 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 roads currently exists in the area; these roads would be used for access to individual well pad sites. These existing unpaved roads would require improvement and application of a gravel base to support drill rig traffic during periods of rainfall or snow.

Access from the existing roads to the well pad sites would require construction of new, short access roads as shown in Figure 2.1-1. A total of approximately 2.5 miles of new access roads would be necessary. Table 2.2-1 lists lengths of new road that would be constructed for each pad site. These access roads would be constructed to approximately 15 feet wide by clearing brush and grading the surface to construct a roadway to the pad site. These roads also would be constructed with a turning radius of no less than 50 feet. Improvements to existing roads and construction of new access roads would only occur immediately prior to the construction of a pad (the road would not be constructed unless the pad was to be drilled).

Figure 2.2-1: Typical Well Pad Site Layout



SOURCE: Ormat Nevada 2007

Table 2.2-1: Ground Disturbance by Pad

Site	Ground Disturbance per Site	Length of New Road	Ground Disturbance per New Road	Total Area of Disturbance
A	2.06 acres	2708 ft	0.9 acres	2.9 acres
B	2.06 acres	553 ft	0.2 acres	2.2 acres
C	2.06 acres	763 ft	0.3 acres	2.3 acres
D	2.06 acres	0 ft	0 acres	2.0 acres
E	2.06 acres	1291 ft	0.4 acres	2.4 acres
F	2.06 acres	0 ft	0 acres	2.0 acres
G	2.06 acres	0 ft	0 acres	2.0 acres
H	2.06 acres	1021 ft	0.4 acres	2.4 acres
I	2.06 acres	883 ft	0.3 acres	2.3 acres
J	2.06 acres	0 ft	0 acres	2.0 acres
K	2.06 acres	0 ft	0	2.0 acres
Total Acreage/ Length of Road	22.66	7,219	2.5	25.16

SOURCE: Ormat 2007

All vehicle traffic associated with the project would be restricted to the designated access roads. Speed limits of 35 mph would be observed on all unpaved roads in the project area in order to minimize dust and avoid collision and incidental death of local wildlife.

2.2.3 WELL PAD FACILITIES AND EQUIPMENT

Drill Rigs

Well pad facilities and equipment would include a drill rig and ancillary equipment, such as generators, support trailers, and well testing equipment. Temperature gradient well and slim holes would use truck-mounted rigs. The mast of the rig would extend from 30 feet up to 178 feet above the ground surface (depending on the type of rig and whether a slim well or exploration well is being drilled). Rig masts are made of a metal lattice and are painted red and white at the top and include flashing lights to meet Federal Aviation Administration (FAA) requirements. Pictures of typical drill rigs are shown in Figure 2.2-2.

Ancillary Equipment and Facilities

A 10,000 gallon water storage truck, mud and water mixing tanks, an above-ground diesel fuel storage tank, pipe rack, drillers/geologist trailers, and a lined reserve pit would be located on the well site. The layout of a typical well pad site is included in Figure 2.2-1.

Electrical power would be provided to the site by diesel generators. Portable sanitary facilities and potable water would be provided at the drill sites and maintained in accordance with applicable health standards. Trash and other non-hazardous solid waste would be collected and stored on-site and periodically disposed of at an off-site disposal facility authorized to accept waste.

Noise mufflers would be used on all rig and air compressor engines. All potential spark-emitting equipment would be fitted with spark arresters.

Each well pad may have one rock muffler. Rock mufflers are approximately 30 feet tall with a radius of about 10 feet and are used to attenuate steam venting noise.

Figure 2.2-2: Example of Different Types of Drill Rigs

Typical Exploration Well (178 feet tall)

Typical Slim Well Rig (50 feet tall)

SOURCE: Ormat Nevada 2007

Reserve Pit

Each well pad site would have a reserve pit. The reserve pit would be constructed 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 waste would be sampled for hazardous contaminants.

The reserve pit would measure approximately 100 feet long by 300 feet wide by up to 8 feet deep, with a capacity of up to 1.5 million gallons. All machinery, drilling platforms, and oil and fuel storage areas on the drill pads have secondary containment up to 110 percent of volume and as a secondary precaution would drain to the reserve pit. Drilling mud flows into the reserve pit and seals the pit to prevent drilling fluids and other liquid run-off from percolating into local groundwater. The pit would be fenced on three sides. The remaining side, facing the inside of the drilling pad and toward the drill rig, would be unfenced. Ormat would limit access to the drill pads and reserve pit to authorized personnel, and appropriate safety and warning signs would be posted at each pad site and entrance road.

Stormwater

Stormwater from areas off of the well pad would be directed to ditches around the well pad and through energy dissipaters into local drainage channels, consistent with stormwater best management practices (BMPs). Stormwater on the pad sites would be directed to the reserve pit.

2.2.4 WATER SOURCE AND SUPPLY

Up to 20,000 gallons per day of water is required for slim well and exploration well drilling. Water requirements for site and road grading, construction, and dust control would average substantially less. One portable water tank holding a total of at least 10,000 gallons would be maintained on the well pad sites during drilling operations. Two additional water trucks would also be used to transport water to the site and would be used to water roads.

Water necessary for all of these activities would be obtained either through purchase from authorized sources or from a shallow water well(s) drilled at one or more of the proposed drill sites, under waiver for the temporary use of groundwater from the Nevada Department of Water Resources. Water wells would be temporary, drilled by a licensed water well driller, and plugged and abandoned in accordance with NAC 534.420. Water wells would be drilled on the geothermal well pad so that that there would be no additional ground disturbance. The location of the water wells would be on the proposed pads; however, it is more likely that the wells would be located on sites J, A, or G (Navy managed lands), under which the shallow aquifer flows.

2.2.5 WELL DRILLING AND TESTING

Types of Wells

The project as proposed includes drilling temperature gradient wells, slim wells, and exploratory wells at the 11 pad sites, with up to 3 wells total at each site. Ormat would not likely need to drill this many wells. A typical exploration program includes 5 to 6 temperature gradient wells, and 2 to 3 each slim and full-size exploration wells.

Temperature Gradient Wells

Temperature gradient wells may be drilled on any of the proposed pad locations. Temperature gradient wells would not require construction of a graded pad and would not require a reserve pit. Temperature gradient wells would be approximately 8.5 inches in diameter and 500 feet deep. These wells are drilled to study the temperature profile with depth.

Slim Wells

Slim wells would be approximately 3,000 to 4,500-plus feet deep and would be drilled to compile lithologic and stratigraphic information and to measure the temperature and geochemistry of subsurface fluids at various depths in the well. Slim wells would be approximately 17 inches in diameter.

Exploration Wells

Exploration wells would be approximately 36 inches in diameter at the top of the well and narrow (telescope) with depth. These wells would be drilled to 8,000 to 10,000 feet in depth. Exploration wells would be completed to produce geothermal fluids to the surface during flow tests.

A profile of each type of well is shown in Figure 2.2-3.

Temperature Gradient Well Drilling, Testing, and Reclamation

Temperature gradient wells would be drilled from pad sites using a continuous wire line core truck mounted rigs about 30 feet in height. Metal mixing tanks are used to mix water and drilling mud. The well would be drilled using air or mud to circulate the drill hole cuttings to the surface. The well would be fitted with blowout prevention equipment (BOPE). Only non-hazardous drilling mud additives would be used. A water-filled cap tubing would be run into the hole to total depth and hung just above the bottom of the well. The tubing would be allowed to equilibrate with formation mixtures, and periodic temperature logs would be recorded. The well would not produce geothermal fluids, and would be used exclusively for determining temperature gradients (change in temperature with depth).

The well would be plugged and abandoned in conformance with the BLM's requirements when sufficient temperature gradient data are obtained from the well. The well would be plugged with mud and cement, the casing would be cut off six feet below ground surface, capped with a welded plate, back-filled, and the site would be restored to previous conditions.

Slim Well Drilling, Testing, and Reclamation

Slim wells are drilled to measure the temperature and geochemistry of the well at various depths. The slim wells are designed to enter the geothermal reservoir zone and potentially bring fluids to the surface for testing.

Drilling

A slim well would be drilled using a truck-mounted rig equipped with diesel engines, fuel and drilling mud storage tanks, mud pumps, and other typical auxiliary equipment. The top of the drill rig derrick would be from 30 to 70 feet above the ground surface, depending on the brand of rig used.

For each new slim well, Ormat would first construct and cement the surface casing of the well. BOPE would be installed on the casing. BOPE is used to ensure that any geothermal fluids encountered do not flow uncontrolled to the surface. The BOPE would be inspected and approved by the Navy, BLM, and/or the Division of Minerals of the Nevada Commission on Mineral Resources (NDOM), as applicable.

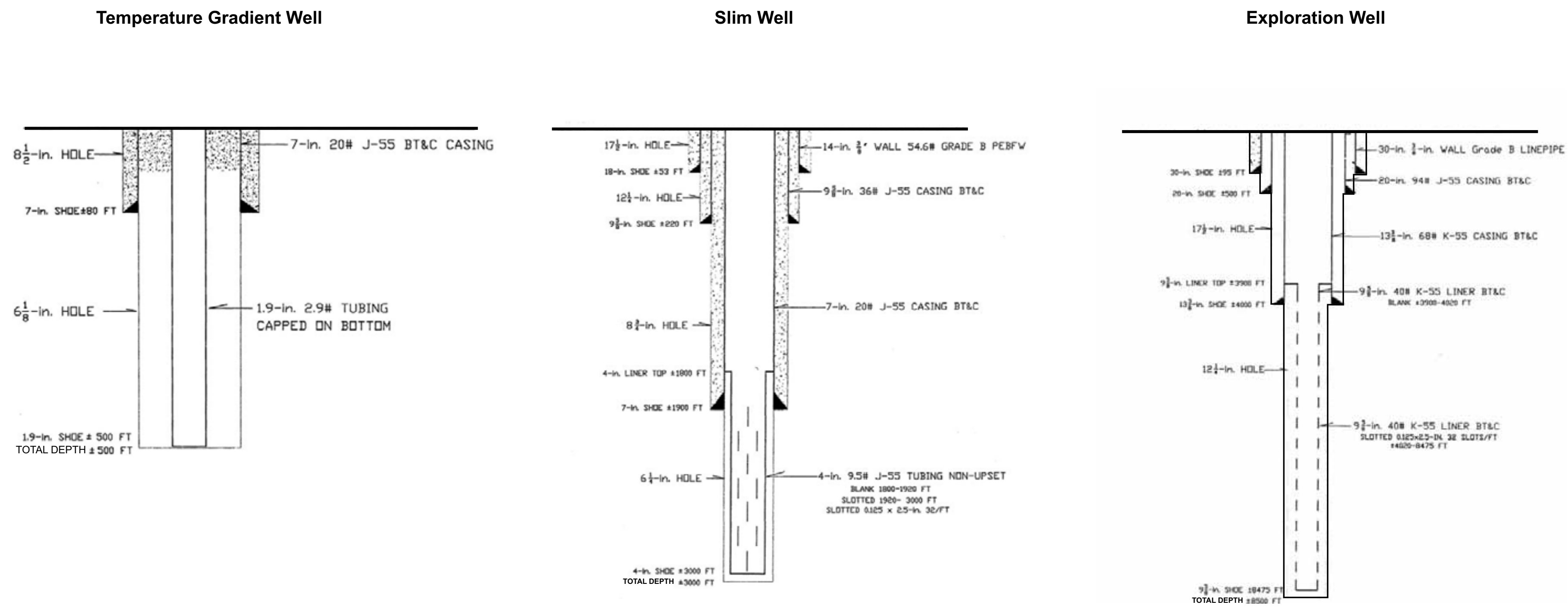
The slim well would be drilled with air or a non-toxic, temperature-stable drilling mud composed of a bentonite clay-water or clay-polymer-water mixture. The drilling mud is used to lubricate and cool the drill bit, bring the rock cuttings to the surface for discharge into the mud tank, and prevent loss of drilling fluids into the rock. Additional additives would be added to the drilling mud as needed to prevent corrosion, increase mud weight, and prevent mud loss, in conformance with the submitted drilling mud program. Additional drilling mud would be mixed and added to the drilling rig's mud system as needed to maintain the required quantities of the drilling mud. Alternative non-hazardous, non-toxic drilling fluids, such as air or aerated water, may be used if under-pressured formations are encountered. The drilling mud is cycled through the drill pipe and drill bit, up and out of the hole, through the drill rig mud system, and back into the drill pipe.

Drill cuttings, consisting of rock chips and fragments produced by the drill bit as it bores the hole, would be produced from the well with the mud, separated from the mud in the drill rig mud system, and discharged, along with any waste drilling mud, into the reserve pit. Additional drilling mud is mixed and added as necessary to maintain the required quantity.

Sampling/Testing

Each slim well would be drilled or cored and completed to a nominal depth of approximately 3,000 feet, or the depth selected by the project geologist. Once drilled or cored to the final depth, the drilling mud in the well would be circulated out of the well bore using water. The water and/or geothermal fluid in the well would be bailed from the well by either lifting with a mechanical bailer or by lifting with air pumped into the well bore so that a clean sample of the geothermal fluid in the reservoir could be obtained for chemical analysis. Alternatively, if the well is capable of flowing, the well may be flowed to the surface through a small steam separator/muffler to separate the steam (which is discharged into the air) from the geothermal water (which is discharged into steel tanks or the reserve pit) so that the geothermal fluid can be sampled.

Figure 2.2-3: Cross-section Examples of Temperature Gradient, Slim, and Exploration Wells



NOTE: Not to scale

SOURCE: Ormat Nevada 2007

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Reserve Pit and Waste Removal

After the slim well drilling operations are completed, any measurable oil would be removed from the reserve pits and properly disposed off site. The liquids from the reserve pits would then be evaporated. The solid contents remaining in each of the reserve pits, typically consisting of non-hazardous, non-toxic drilling mud and rock cuttings, would be mixed with the excavated rock and soil and buried by backfilling the reserve pit. All reserve pit waste would be tested for hazardous contaminants. If the pad is not going to be used for an exploration well, the waste would be removed to a facility authorized to receive such wastes.

Monitoring/Reclamation

Subsequent to drilling and prior to abandonment of the slim well, the wellhead valve would be secured with a chain and lock, and a metal wellhead bonnet would be secured over the wellhead and locked in place to prevent unauthorized access. The slim well would be periodically inspected until the well is abandoned.

When sufficient data are secured from the slim well, the hole would be plugged and abandoned in conformance with BLM requirements by filling the well bore with clean, heavy abandonment mud and cement until the top of the cement is at ground level, then cutting off the casing and tubing below ground level.

The pads would either be further developed into exploration well pads, or reclaimed. Reclamation would include restoring grade and placing stockpiled topsoil or gravel over the site. A diverse perennial native seed mix certified as being free of noxious weed materials would be used to seed the areas, if the site needs to be re-vegetated.

Exploration Wells

The full-size geothermal exploration wells are designed to drill into and flow test the fluids from the geothermal reservoir to identify the characteristics of the geothermal reservoir and determine if the geothermal resource is commercially viable.

Drilling

Each exploration well would be drilled with a large rotary drill rig. During drilling, the top of the drill rig mast could be as much as 178 feet above the ground surface, and the rig floor could be 20 to 30 feet above the ground surface. Each exploration well would be drilled using a typical rotary drill rig with a minimum 12,000-foot rated capacity and with a 750,000-pound derrick live load capacity. The rig is equipped with diesel engines, fuel and drilling mud storage tanks, mud pumps, and other typical ancillary equipment.

The exploration wells would each be drilled and cased to a design depth of approximately 9,500 feet, or the depth selected by the project geologist. BOPE would be utilized while drilling below the surface casing, similar to the slim hole. During drilling operations, a minimum of 10,000 gallons of water and 12,000 pounds of inert, non-toxic, non-hazardous barite (barium sulfate) would be stored at each well site for use in preventing uncontrolled well flow (to potentially be used for "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 prevent corrosion, 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.

In the event that very low pressure areas are encountered, 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.

Each exploration well may need to be worked over or redrilled if mechanical or other problems that prevent proper completion of the well in the targeted geothermal reservoir are encountered while drilling or setting casing or if the well does not exhibit the anticipated permeability, productivity, or injectivity. Depending on the circumstances encountered, working over a well may consist of lifting the fluid in the well column with air or gas or stimulation of the formation using dilute acid or rock fracturing techniques. Well redrilling may consist of reentering and redrilling the existing well bore, reentering the existing well bore and drilling and casing a new well bore, or moving the rig over a few feet on the same well pad and drilling a new well bore through a new conductor casing.

Directional Drilling

Ormat may decide to conduct directional drilling at each site based on the location and extent of geothermal resources in proximity to the well site. Directional drilling at sites A, G, and J (the pad sites on NAS Fallon managed lands) would likely result in a deep bottom hole located under BLM lease areas. Ormat Geothermal Drilling Permit applications would be submitted to the BLM for the drilling of these wells, pursuant to 43 CFR 3261.11.

Testing

If the deep exploration well is successful and encounters the geothermal resource, well testing would be conducted to define resource characteristics.

The geothermal exploration wells would each be subject to one or more initial, short-term flow tests and one or more long-term flow tests to test the productivity of the geothermal reservoir and sample the geothermal fluid.

Once the slotted liner has been set in the bottom of the well bore, and while the drill rig is still over the exploration well, the residual drilling mud and cuttings would be flowed from the well bore and discharged to the reserve pit. This may be followed by one or more short-term flow tests, each lasting from two to four hours and may also conducted while the drill rig is over the well. Each test would consist of flowing the geothermal fluids from the exploration well into portable steel tanks while monitoring geothermal fluid temperatures, pressures, flow rates, chemistry, and other parameters. An “injectivity” test may also be conducted by injecting the produced geothermal fluid from the steel tanks back into the well and the geothermal reservoir. The drill rig would likely be moved from the well site following completion of these short-term tests.

One or more long-term flow test(s) of each exploration well drilled would likely be conducted following the short-term flow test(s) to more accurately determine long-term well and geothermal reservoir productivity. The long-term flow test(s), each lasting approximately five days or more, would be conducted by either pumping the geothermal fluids from the well through onsite test equipment closed to the atmosphere (using a line shaft turbine pump or electric submersible pump), or allowing the well to flow naturally to the surface, where the produced steam and non-condensable gases (including any hydrogen sulfide), separated from the residual geothermal fluid, would be discharged into the atmosphere. In either case, a surface booster pump would then pump the residual produced geothermal fluid to the constructed reserve pit. The onsite test equipment would include standard flow metering, recording, and sampling apparatus.

The long term-test would consist of pumping the geothermal fluids from the well for approximately five days through onsite test equipment closed to the atmosphere. Alternatively, the well could be naturally flowed to the surface, where the produced steam and non-condensable gases would be separated from the geothermal fluid and discharged to the atmosphere. A surface booster pump would then pump the produced geothermal fluid through a temporary pipeline to one of the other exploration wells where it would be injected back into the geothermal reservoir. The temporary pipelines would be located on the shoulder of roads to avoid additional surface disturbance.

The onsite test equipment would include standard flow metering, recording, and sampling apparatus. Surface test equipment and temporary pipelines (all located within the pad site) would be removed once the testing was complete, although instruments or equipment to monitor well temperature and pressure and to collect samples would remain.

Reserve Pit and Waste Disposal

The reserve pits would contain drilling fluids. At the conclusion of drilling and testing, the liquid portions of the containment basin contents would be evaporated, pumped back down the well, or removed and disposed of off-site in a facility authorized to receive such wastes. The remaining contents, typically consisting of non-toxic drilling mud and cuttings, would be tested as required by the Nevada Bureau of Water Quality Planning (BWQP). If non-toxic and as authorized by the BWQP, these materials would be spread and dried on the well site, mixed with soil and buried in the on-site reserve pit in conformance with the applicable requirements of the BWQP and the BLM. All reserve pit waste would be tested for hazardous contaminants. If burial on site is not authorized, the solids would be removed and either used as construction material on private lands or disposed of in an authorized facility to receive and dispose of these materials. Non-hazardous solid waste materials such as debris, trash, and miscellaneous waste items, would be deposited at an authorized landfill by a contractor.

As stated previously, potable water would be trucked to the site for consumption purposes. Sanitary facilities would be provided and maintained by a licensed local contractor during construction, drilling, and well testing activities.

Pad Reclamation

Upon the completion of exploration drilling and flow testing, a decision would be made regarding the commercial potential of each well or its potential as an injection well. If the well is determined to have commercial potential, well operations would be suspended pending completion of a Plan of Development and Utilization, environmental review, and receipt of all necessary permits. The well would likely continue to be monitored until it can be utilized for production. Once the well is shut down, downhole pressure buildup data at the depth of the reservoir may also be obtained to record post-production transient pressure phenomena.

If the well or wells are determined to not have commercial potential, they may continue to be monitored or may be abandoned in conformance with the well abandonment requirements of the BLM and the Navy. Abandonment typically involves plugging the well bore with cement sufficient to ensure that fluids would not move across into different aquifers.

After drilling operations are completed, any measurable oil would be removed from the reserve pits and properly disposed off-site. The liquids and solids from the reserve pits would then be disposed of as stated above under *Waste Disposal*. The well head (and any other equipment) is then removed, the casing cut off well below ground surface, and the well site reclaimed.

The drill pads would then be graded, if necessary to restore grade to the approximate original contours, and stockpiled topsoil (if any) or gravel would be placed back over the site. If necessary to re-vegetate the disturbed areas, a diverse perennial seed mix certified as being free of noxious weed materials would be used to seed the areas.

2.2.6 SCHEDULE, PERSONNEL, AND EQUIPMENT

Ormat proposes to initiate activities as soon as the required project permits and approvals are obtained, most likely by the winter of 2007. The proposed project would be implemented over the next one to four years.

Temperature Gradient Well

An average of four to six small trucks, service vehicles, and worker's vehicles would be driven to the temperature gradient well site each day throughout a typical 2-7-day drilling process. Other equipment at the project site would include the drill rig. Drilling would be conducted 24 hours per day, 7 days per week by a crew of up to three workers.

Slim Well

An average of four to six small trucks, service vehicles, and worker's vehicles would be driven to the active slim well site each day throughout the typical 15-day drilling process. Difficulties encountered during the drilling process, including the need to re-drill the slim well, could as much as double the time required to successfully complete each slim well.

Drilling would be conducted 24 hours per day, 7 days per week by a crew of up to three workers. Other support personnel (geologists, suppliers, etc.) could bring the total number of workers on site at one time to as many as six to ten persons. A geologist and/or driller would be living on the pad site in the trailer since work has to be conducted 24 hours per day.

Exploration Well

The typical drill rig and associated support equipment (rig floor and stands; draw works; mast; drill pipe; trailers; mud, fuel and water tanks; diesel generators; air compressors; etc.) would be brought to the prepared pad on 25 or more large tractor-trailer trucks.

Additional equipment and supplies would be brought to the drill site during ongoing drilling and testing operations. As many as ten or more tractor-trailer truck trips would be generated on the busiest day, although on average about two to three large tractor-trailer trucks (delivering drilling supplies and equipment), and about eight small trucks/service vehicles/worker vehicles, would be driven to the site each day throughout the typical 45-day drilling process. Difficulties encountered during the drilling process, including the need to work over or to re-drill the hole, could double the time necessary to successfully complete an exploration well. Drilling would be conducted 24 hours per day, 7 days per week by a crew of 9 to 10 workers. The number of workers on site during drilling would be as high as 18 for short periods of time. The drilling crew would typically sleep in a trailer on the drill site.

2.2.7 ENVIRONMENTAL PROTECTION MEASURES

Ormat would comply with all special lease stipulations attached to leases NVN-079104 and NVN-079105 that are applicable to the proposed project operations (Appendix C). The project would comply with all State and federal requirements. The conditions of approval may be included in the GDP to be approved for each drill site. Ormat would comply with any mitigation that may result from this EA.

Ormat would inform all personnel, as well as well drilling, testing, and supply contractors, of policies regarding protection and undue degradation of the environment. These measures are intended to prevent all unacceptable impacts from occurring as a result of these operations, as is required under the special stipulations of the Federal geothermal leases. Protection of the environment is discussed in detail in Chapter 4, Environmental Consequences.

Environmental protection measures would include:

- All vehicles would be equipped with fire extinguishers and shovels
- A water source would be identified and approved by the BLM/BOR/Navy
- All brush build-up around mufflers, radiators, headers, and other engine parts must be avoided; periodic checks must be conducted to prevent this build-up
- Smoking would only be allowed in company vehicles and/or designated smoking areas; all cigarette butts would be placed in appropriate containers and not thrown on ground or out windows of vehicles. No smoking would be allowed outside designated areas
- Cooking, campfires, or fires of any kind would not be allowed
- Portable generators used in the Project Area would be required to have spark arresters

2.3 Alternatives

2.3.1 NEPA REQUIREMENTS

NEPA requires that a reasonable range of alternatives to the Proposed Action be considered that could feasibly meet the objectives of the Proposed Action as defined in the purpose and need for the project [40 CFR 1502.14(a)] (see Chapter 1). The range of alternatives required is governed by a “rule of reason” (i.e., only those feasible alternatives necessary to permit a reasoned choice need be considered). Reasonable alternatives are those that are practical or feasible based on technical and economic considerations [46 Federal Register 18026 (March 23, 1981), as amended; 51 Federal Register 15618 (April 25, 1986)].

Alternatives to the Proposed Action must be considered and assessed whenever there are unresolved conflicts involving alternative uses of available resources [BLM NEPA Handbook H-1790-1, page IV-3 (BLM 1988)]. One alternative to the proposed action have been identified to reduce or avoid potential effects to cultural resources. This alternative would meet Ormat’s purpose to:

- Determine subsurface temperatures on Navy and BOR managed lands;
- Confirm the existence of geothermal resources on Navy and BOR managed lands; and
- Confirm the existence of a commercial geothermal reservoir at the proposed drill sites within the Carson Lake Geothermal Project Area

2.3.2 ALTERNATIVE 1: PLACEMENT OF WELL PAD B, C, AND H FARTHER WEST FROM GRIMES POINT

Alternative 1: Placement of Well Pad B, C, and H farther west from Grimes Point Trail, was developed to relocate well pads B, C, and H away from the formation associated with Grimes Point, which is a particularly sensitive archaeological area.

Well pad construction and drilling of both slim wells and/or exploration wells would be the same as the Proposed Project. The well pad locations under Alternative 1 are shown below in Figure 2.3-1 and the township/range, section, and UTM coordinates are shown in Table 2.3-1. Note that sites A, D, E, F, G, I, and J are the same as the proposed project. Alternative pads B, C, and H are denoted B_1, C_1, and H_1. Site B_1 would be located on US Navy lands.

Table 2.3-1: Well Pad Locations under Alternative 1

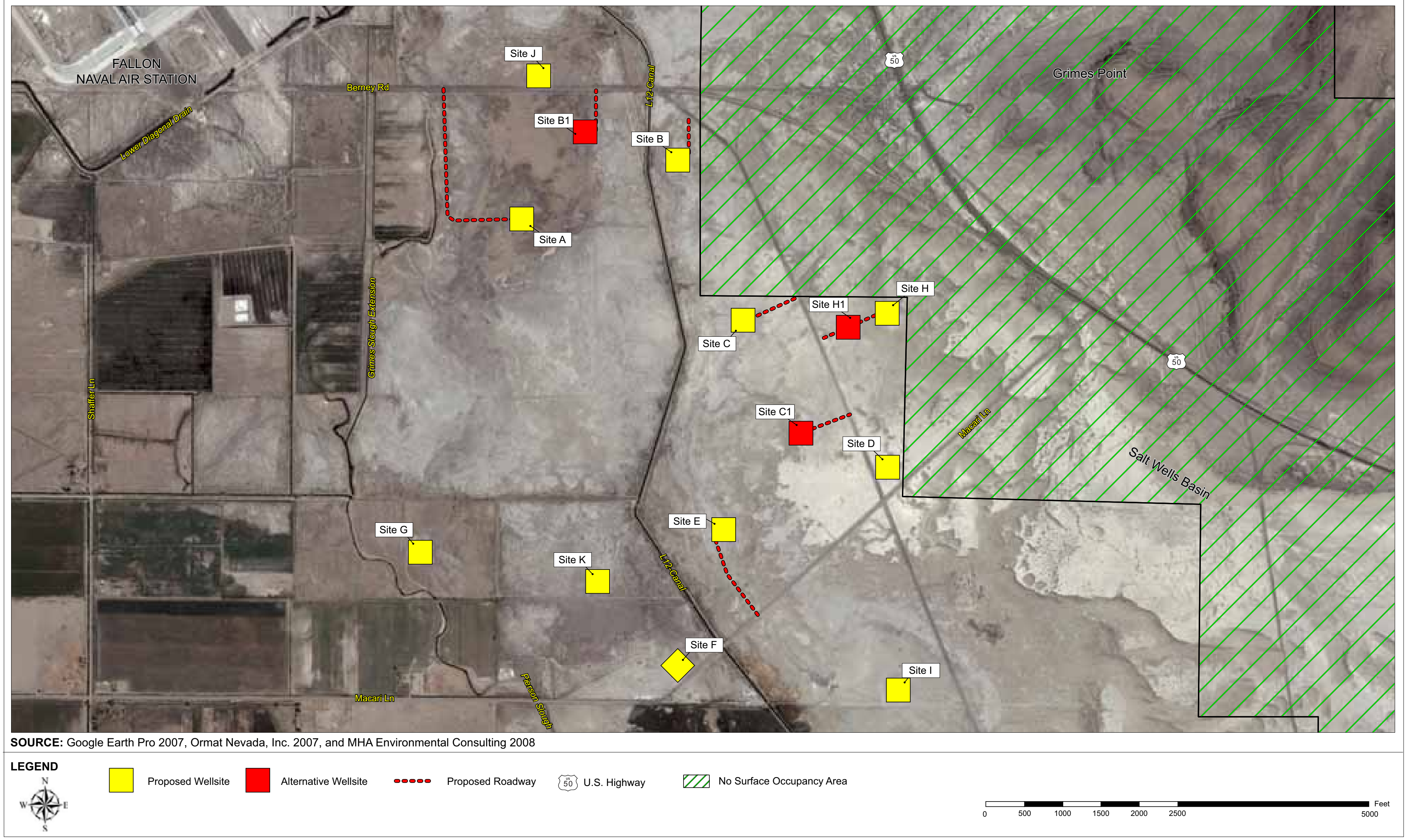
Site	Kettleman Number	Township/Range	Section Number	UTM Coordinates (NAD 83)	
				Easting (m)	Northing (m)
A	14-30	T 18N / R 30E	30	356367	4362214
B_1	31-30	T 18N / R 30E	30	356770	4362500
C_1	77-30	T 18N / R 30E	30	357480	4361350
D	78-30	T 18N / R 30E	31	357793	4361217
E	41-31	T 18N / R 30E	31	357106	4360961
F	55-31	T 18N / R 30E	31	356975	4360394
G	72-36	T 18N / R 29E	36	355939	4360901
H_1	85-30	T 18N / R 30E	30	357710	4361800
J	18-19	T 18N / R 30E	19	356454	4362814
K	32-31	T 18N / R 30E	31	356647	4360727

SOURCE: Ormat 2007

2.3.4 NO ACTION ALTERNATIVE

The No Action Alternative includes no action of any kind. No geothermal exploration or development of any kind would occur. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the project description would occur. No impacts to the existing environment would occur as it would remain unchanged. No mitigation would be necessary.

Figure 2.3-1: Location of Well Pad Sites Under Alternative 1



SOURCE: Google Earth Pro 2007, Ormat Nevada, Inc. 2007, and MHA Environmental Consulting 2008

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2.4 Applicable Statues, Regulations, and Policies

Several federal and state permits would be necessary for exploration activities, as shown in Table 2.4-1, below.

Table 2.4-1: Permits and Approvals Required for Exploration Activities

Agency	Permit/Approval
Federal	
U.S. Fish and Wildlife Service	Section 7 of Endangered Species Act consultation and concurrence for effects to rare, threatened, or endangered species.
Bureau of Land Management	Permit to Drill
Bureau of Reclamation	Cooperating Agency as land manager
State	
Division of Minerals	State Drilling Permit
Division of Water Resources	Waiver for temporary use of groundwater
Division of Environmental Protection	Underground Injection Control Permit; NPDES Permit; Temporary Discharge Permit; General Storm Water Permit
Division of Historic Preservation and Archaeology	Commenting authority; concurrence with Section 106 compliance
Department of Wildlife	Commenting authority
Bureau of Water Quality Planning	Testing of reserve pit wastes

SOURCE: Ormat 2007