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DIVISION OF MINERALS

STATE OF NEVADA  
COMMISSION ON MINERAL RESOURCES  
DIVISION OF MINERALS  
400 W. King Street, Suite 106  
Carson City, Nevada 89703  
(775) 684-7040 | Fax (775) 684-7052  
http://minerals.nv.gov

Date Received	_____
API Number	<u>27-021-90072</u>
County	<u>MINERAL</u>
Permit Number	<u>1476</u>
FOR DIVISION USE ONLY	

**GEOHERMAL INJECTION WELL PERMIT APPLICATION**

The applicant  
ORNI 47 LLC

Name (or Corporate/Business Name)

Street Address 6140 Plumas St  
 City Reno State NV Zip Code 89519  
 Telephone 775-356-9029  
 Email mhanneman@ormat.com

hereby makes application for a geothermal development permit, State of Nevada, Division of Minerals.

Applicant is:  Land Owner  Lease Holder  
 Well Name: 42-8  
 Lease Name/No: Wild Rose NVN-83931 Split Estate?  Yes  No  
 Land Type:  Federal (BLM, USFS, etc.)  Private  State  
 Type and Amount of Bond: Nation wide BLM bond \$250,000  
 (Exempt for Domestic Class)

Bond Issued by: BofA  
 Serial No. NVB000284

Well Location: NE 1/4, NW 1/4, Section 8,

Township 11N, Range 33E, County Mineral.

UTM Northing 4299936 N; UTM Easting 387905 E (NAD83 Datum)

Operator's:  
 Name: Ormat Nevada Inc.  
 Address: 6140 Plumas St.  
 City, St Zip: Reno, NV 89519

Drilling Contractor's:  
 Name: Major Drilling  
 Address: 2200 S, 4000 W  
 City, St Zip: Salt Lake City, UT 84120  
 Telephone: 801-974-0645

Hole Size: 8.5 inch Casing Size: 7 inch Weight/Gauge: 20# K-55 BTC

Size of BOP:  2000 psi  3000 psi  5000 psi

Rotary Description:

Schramm T685 mud rotary

Identify or locate the sources of the fluids which will be injected:

If drilling and testing determines that the site is suitable, injected fluids will be from power plant.

Estimated average daily volume of fluids injected 6,000,000 gallons.

Maximum daily volume of fluids injected 7,500,000 gallons.

Estimated maximum injected pressure 120 psi, temperature 160 °F

List proposed metering equipment, pipelines and safety devices that will be used to prevent accidental pollution:

This is an exploration well that is being drilled to determine the connectivity of the site to the main portion of the geothermal system, and determine if it is suitable for future injection. Cemented casing will prevent impacts to shallower groundwater.

Total Depth to be Drilled: 2,000

Drilling will Commence On: April 1, 2019

Is this well location under an Underground Injection Permit?

If so, provide NDEP Permit number UNEV 2013201. Well will be added to permit, if successful.

I certify this information to be true, correct, and complete and that no pertinent matter inquired about in this application has been omitted.

Signature of Applicant/Agent: Mark Hanneman

Print Name: Mark Hanneman

Date: February 15, 2019

Please attach a detailed drilling program including the following information:

1. Well design schematic; casing and mud programs; potential water supply; drilling rig to be used and pad layout; blow out prevention equipment diagram and testing program; directional drilling information if applicable; map of location and access roads. Additional information may be required upon review.
2. The required fee per NAC 534A 210 or 534A.212.

**CONDITIONS OF PERMIT**

1. All permittees must comply with appropriate sections of the Geothermal Rules and Regulations of the Division of Minerals and with applicable rules and regulations of other local, state, and federal agencies.
2. During the drilling of geothermal injection wells, all water strata above the geothermal horizon being used must be sealed or separated in order to prevent their contents from passing into other strata.
3. All fresh water and water of value or possible value for other beneficial uses must be confined to their respective strata and be adequately protected by methods approved by the Division. Precautions must be taken in drilling and abandoning wells to guard against any loss of fresh water from the strata in which it occurs, and the contamination of any fresh water by objectionable water.
4. The operator of any well must shut off and exclude all water from any geothermal resource-bearing stratum to the satisfaction of the Division.
5. See attached Conditions of Approval.
6. Please send daily drilling reports to : Lowell Price.....[lprice@minerals.nv.gov](mailto:lprice@minerals.nv.gov)  
and  
Valerie Kneefel.....[vkneefel@minerals.nv.gov](mailto:vkneefel@minerals.nv.gov)
7. Additional Conditions/Comments

A.	
B.	
C.	

This permit does not extend the permittee the right of ingress and egress on public, private or corporate lands.

The issuance of this permit does not waive the requirements that the permit holder obtain other permits from State, Federal, and local agencies.

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**PERMIT APPROVAL**

Approved 3/11/2019 with the conditions noted above.  
Date

Permit Number 1476

  
\_\_\_\_\_  
Administrator  
Division of Minerals



**STEVE SISOLAK**  
Governor

STATE OF NEVADA  
COMMISSION ON MINERAL RESOURCES  
**DIVISION OF MINERALS**  
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**RICHARD PERRY**  
Administrator

**Las Vegas Office:** 2030 E. Flamingo Rd. #220, Las Vegas, NV 89119  
Phone: (702) 486-4343; Fax: (702) 486-4345

## **GEOHERMAL CONDITIONS OF APPROVAL FOR INJECTION WELL DRILLING PERMIT**

Submit forms and correspondence to: Nevada Division of Minerals  
400 West King Street  
Suite 106  
Carson City, NV 89703

Communications with the Division shall be directed to:

Lowell Price, Oil, Gas and Geothermal Program Manager  
Office 775-684-7045      Email [lprice@minerals.nv.gov](mailto:lprice@minerals.nv.gov)  
Cell 775-721-1774  
Fax 775-684-7052

Rich Perry, Division Administrator  
Office 775-684-7047      Email [rmperry@minerals.nv.gov](mailto:rmperry@minerals.nv.gov)  
Cell 775-721-0282  
Fax 775-684-7052

Voicemail is available on all cell phones and office phones. Please leave a message if you are unable to speak to someone and we will return your call as quickly as possible.

By provision of the current Memorandum of Understanding between NDOM and BLM, you may contact the following individuals for information or approvals. Approvals under the MOU apply to Fee and Federal lease locations.

John Menghini, Fluid Minerals Team, Petroleum Engineer, Reno  
Office 775-861-6573      Email [John\\_Menghini@blm.gov](mailto:John_Menghini@blm.gov)  
Cell 775-223-1359  
Fax 775-861-6711

YOUR APPLICATION TO DRILL THE **ORNI 47 LLC WILD ROSE 42-8** INJECTION WELL IS APPROVED SUBJECT TO THE FOLLOWING PERMIT CONDITIONS

1. These conditions and the minimum Blow Out Prevention Equipment (BOPE) requirements shall be posted at the well site and read by all company personnel associated with the subject well.
2. The operator shall give notification at least 48 hours prior to spudding, drill stem testing, or production or injection testing operations. 24 Hours notification is required prior to the testing of casing or BOPE. These notifications may be by telephone or email. Please refer to the contacts list on page one of this notice.
3. If the cementing mix for the lead cement in this program includes a 10 lb/sk of Spherelite, a spherical additive for reducing density of cement mix, and a high resolution CBL may be required if the cement does not reach surface, or if the cementing of the casing appears inadequate. This additive has been found to interfere with normal cement bond logging (CBL). The product manufacturer has stated that good logging may be achieved with a high resolution CBL. This log can be more expensive and difficult to schedule. The operator is here notified that if this mix is used and a CBL is required by the regulatory agencies, a high resolution logging may also be required if the CBL is found to be inadequate in the evaluation of the cement behind casing, unless an alternative satisfactory method of confirming cement bonding is approved by the regulatory agencies.
4. Well Cellars - For corrosion prevention, the cellar must be engineered, constructed, and/or maintained, to preclude standing water from long-term contact with the casing or wellbore assembly. The top of the surface casing will be a minimum of 24 inches above the cellar floor, or ground level if a cellar is not present. Surface casing will be as high as possible around intermediate casing with excess, tapered cement so water does not pool on top of cement. At the completion of the well, the drilling pad is to be contoured in a manner that drains water away from the cellar, or surface casing if a cellar is not present.
5. Change in Plans - NAC 534A.540 (3) (g) specifies the operator will submit a sundry for permission for change of drilling plans. Verbal permission may be granted. Subsequent sundry form submission is required. Please refer to attached Sundry Notice Requirements.
6. Surface Casing - NAC 534A.260 (3) requires that surface casing be sufficient to protect fresh water aquifers and not less than 10% of the proposed total depth or well or minimum 50 feet. The cementing of casing strings shall be done using the standard procedure of inside casing displacement or tab-in methods, unless other methods are approved prior to the cementing procedure.
7. Cementing - NAC 534A.260 (3, 4, 5) requires surface and intermediate casing to be cemented to surface. If one hundred percent (100%) returns are not obtained during the cementing operation, or if the cement falls back in the annulus, a top cement job shall be required, unless another cement program has been approved. If unconventional cement formulations are used, there must be a cased-hole logging technique available to determine the adequacy of cement bonding and hydraulic seal for the particular unconventional cement product used.
8. BOPE - After surface casing is set, all wells shall be equipped with at least the minimum required Blowout Prevention Equipment (BOPE), unless otherwise approved. NAC 534A.260 (5) requires

BOPE to be tested to at least 500 psig for 30 minutes with <10% pressure loss or as approved by the Division. BOPE should be in accordance with good established oil field practice with adequate kill lines and good working order.

9. Perform casing shoe pressure test at all casing shoes – A successful casing shoe pressure test, must be performed before drilling deeper. The Division does *not* want the formation or cement to be fractured or broken down during the test. The purpose of this test is to ensure the integrity of the cement job by showing the area below and around the casing shoe will hold pressure. The operator is to drill out no further than five feet out of the casing shoe, and then pressure up to approximately 10% below the known or estimated fracture gradient for a minimum of 30 minutes. In order to pass a casing shoe pressure test there can be no more than a 10% pressure loss over the course of the minimum 30 minute test. In the event of a failed casing shoe pressure test, a cement squeeze job must be performed below the casing shoe. A successful casing shoe pressure test must be performed before drilling deeper. The following formula is to be used for the applied surface pressure calculation:

Calculate the downhole pressure for a specified or targeted pressure gradient  
Specified Pressure Gradient {(psi/ft) x vertical depth (ft)} = Pressure G (psi)

Calculate the downhole pressure due to the current mud in the hole  
Mud Density {ppg} x vertical depth (ft) x 0.052 = Pressure M (psi)

Calculate the surface pressure required to test formation or shoe to a specified gradient  
Pressure G - Pressure M = Required Surface Pressure (psi)

Example of Formation Integrity Test at 20" Surface Casing Shoe:

Casing Shoe at 271 ft (TVD)

Mud Weight- 9.0 ppg

Specified Pressure Gradient to test casing the 20" shoe - 0.6 psi/ft

Pressure G = 0.6 psi/ft x 271ft = 162.6 psi

Pressure M = 9.0 ppg x 271 ft x 0.052 = 126.8 psi

Required Surface Pressure = Pressure G - Pressure M = 162.6 - 126.8 = 35.8 psi

10. Injection liner – If an injection liner is utilized the liner hanger must be located at least 100 feet above the surface or intermediate casing shoe.
11. Directional Drilling - NAC 534A.360 requires directional surveys (inclination and azimuth) to be run on any well permitted directionally drilled well. Division conditions of approval further require directional survey (inclination and azimuth) where the inclination exceeds 5 degrees or the projected bottom hole location would be 100 feet or less from the lease boundary, unless otherwise approved by the Division of Minerals. Direction surveys must be performed at least every 250 feet in the directionally drilled portion of the wellbore. The operator is advised that cased-hole logging for the evaluation of cement bonding and hydraulic seal may also be required as part of the well completion. The cased-hole logging technique(s) utilized by the operator must be able to give conclusive results regarding the initial quality of cement bonding and hydraulic seal.
12. Hydrogen Sulfide – If hydrogen sulfide is encountered well must be shut-in until measured amounts are determined. Values of hydrogen sulfide encountered must be reported to the Division of Minerals.

13. Air/Aerated Drilling Operations – For air/aerated drilling operations, the following equipment shall be utilized: banjo box (or equivalent), and a staked down blooie line directed to the reserve pit with a minimum distance of 100 feet.
14. **Cuttings** – *NAC 534A.310 requires samples of cutting shall be collected and submitted to Nevada Bureau of Mines and Geology (NBMG). Division conditions of approval further require a minimum of 30-intervals from surface to the surface casing point and require 10-foot intervals from the surface casing shoe to total depth.*
- a. *TWO separate sets of cuttings are to be sent prepaid to the Great Basin Science Sample and Records Library, Nevada Bureau of Mines and Geology, 2175 Raggio Parkway, Reno, Nevada 89512. For more information phone 775-682-8766 or e-mail [nbmgs@unr.edu](mailto:nbmgs@unr.edu).*
  - b. *EACH SET is to consist of at least 15 milliliters of cuttings per sampling interval that must be cleaned, dried, and placed into 3"x5" sample envelopes. The envelopes are to be placed in order by interval into common drill cutting boxes with approximate dimensions of 3"x5"x20". The envelopes are to be identified by the Division permit number, well name/number as noted on the Geothermal Resource Development Permit Application (Kettleman number alone with suffice if given), and interval.*
  - c. *The sets are to be PROPERLY IDENTIFIED as follows: Each box is to have legibly written on one end the name of the operator and well as noted on the Geothermal Resource Development Permit Application, Division permit number, total interval (missing intervals noted), and set number.*
  - d. *NOTE: the cuttings are not to be sent to the Division of Minerals. The cuttings are due within 15 days of completion of the well. The operator will be responsible for the cost of any further handling of your samples by the NBMG required to meet the standards set out in this permit condition.*
15. **Drilling Reports** - A minimum of one drilling report shall be submitted to the Division of Minerals each week during drilling operations, notifying the Division of the drilling process. The Division of Minerals requests daily drilling reports. These reports may be submitted via mail, fax or email.
16. **Well Completion Report** - NAC 534.550 (1) (a) requires a well completion form to be filed with the Division of Minerals within **30 days** of the cessation of drilling (rig release date).
17. **Logging** - NAC 534A.350 requires two copies of all well logs run, including lithological and electrical, neutron-gamma or similar, to be filed with the Division. Computed results in LAS format must also be submitted to the Division for each electric log run. Electronic files are to be provided on CD Rom. These logs are to be submitted within 60 days of the completion of the well.
18. **Survey Plat** - NAC 534A.205 requires a certified plat of the location by a professional land surveyor of the well must be filed with the Division of Minerals within **60 days** of completion of the construction of the well.

19. Emergency Notification - In the event of a serious accident, blow out, spill or fire, immediately notify the Division of Minerals (see page one for contact information).
20. Spills - Spills or accidental discharge of hydrocarbons in excess of 25 gallons must be reported to the Nevada Division of Environmental Protection at 1-888-331-6337.
21. Plugging - NAC 534A.540 require all plugging and abandonment programs to be approved prior to commencing plugging and abandonment work. Verbal approval may be given. Subsequent submission of forms is required with 30 days of completion of plugging operations.
22. UIC Requirements – Operators must refer to NDEP Underground Injection Control information publications which can be accessed at [http://ndep.nv.gov/bwpc/renewable\\_uic07.htm](http://ndep.nv.gov/bwpc/renewable_uic07.htm) These documents will provide you with guidance for collection of data during the drilling progress which will be required for submission with an application for an Underground Injection Permit.
23. Well head protection and cellar design – Cellar design must prohibit soil and water contact with casing and well head components, as well as prevention of standing water around same. If water chemistry indicates corrosion precautions and / or cathodic protection may be necessary. The operator must be prepared to document water chemistry and protective measures taken to permit injection into the well via a UIC permit. For further information contact NDEP Bureau of Water Pollution Control 775-687-9418 or visit the Bureau’s website [ndep.nv.gov](http://ndep.nv.gov)
24. Injection Testing and Stimulation Programs – Programs must have prior approval from the Division. Completion Reports must be accompanied by the appropriate checklist of information regarding these programs.
25. **The enclosed Abandoned Mines brochure shall be posted at the well site alongside the Conditions of Approval and the Minimum Blow Out Prevention Equipment Requirements and read by all company personnel associated with the subject well. The operator shall inform all drilling personnel and contractors associated with the drilling of the well of potential dangers, including bodily injury, associated with the exploration of abandoned mine workings, as well as the disturbance of possible bat habitats.**
26. The Operator shall ensure proper centering of the casing strings for new wells with downhole centralizers as well as centering the top of the casing with the drilling rig during and immediately after cement is put in place. The Operator must also ensure that the number and depths of casing centralizers are recorded in a contemporaneous log during the installation of the casing strings.



SUNDRY NOTICES  
OIL, GAS AND GEOTHERMAL

Verbal approval for the following work may be given by the Division:

1. Any emergency work necessary to prevent or control blow outs or other situations with significant potential to result in injury to the crew or damage to the environment or resource.
2. Any kick-offs necessary to by-pass bad hole or fish left in hole.
3. Changes in casing points due to bad hole.
4. Deepening, attempting to encounter resource.



5. Necessary well work to keep geothermal power plants operating.
6. Drilling equipment failure.
7. Squeeze or plug backs to prevent any injected geothermal or oil field waters from contaminating other water zones.

The operator is required to file a written sundry notice with the division subsequent to verbal approval. Verbal approvals will not be given for any work that can be planned in advance, such as acidizing, changes in casing points or completion, etc., reentry of a well, remedial work, production or injection testing.